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ABSTRACT

This compendium of water education curricula describes a variety of instructional materials stressing California water conservation which are available upon request. The individual materials are suggested for use by the following grade levels: K-3; 2-4; 3-6; 6-9; 9-12; and K-12. Partial segments of each of the 23 brochures are illustrated along with a description of the publication. Also included are suggestions for the use of each brochure in the classroom. Topics include: "The Guzzler Gang"; "Water Fun"; "Water Play"; "The Water Cycle"; "Travelling with Ricki the Rambunctious Raindrop"; "Water Is Your Best Friend"; "Water Is Peter's Best Friend"; "Peter's Magical Water Journey"; "Admiral Splash"; "The California Water Works and Why It Does"; "The Tardy Twins Meet Polluto"; "Water for Ursa"; "A Journey down the Colorado River Aqueduct"; "Be Water-Wise"; "The Official Captain Hydro Water Conservation Workbook"; "Water Lifelines for Los Angeles"; "The Further Adventures of Captain Hydro"; "The California Water Map Program"; "The Delta Dilemma"; "Project Water Science"; "A Sense of Water"; "Regional Teacher's Guide Supplement"; and "The Story of Drinking Water." Also included are a referencing of these materials to the concepts related to water education, as listed in the "Science Framework Addendum for California Public Schools," 1984. A 50-item bibliography of additional resources is provided. (ML)

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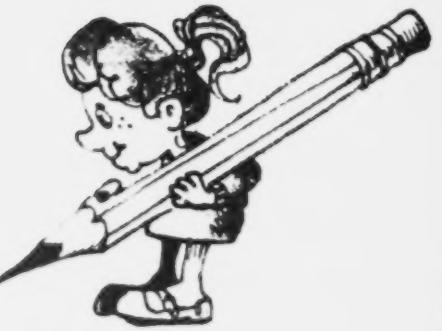
WATER EDUCATION CURRICULA:

A Compendium



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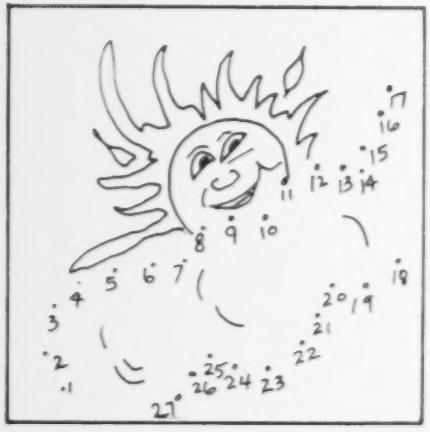

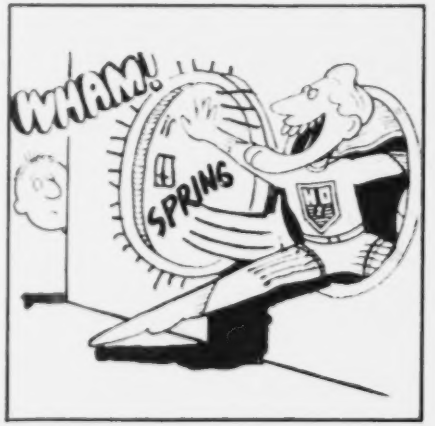

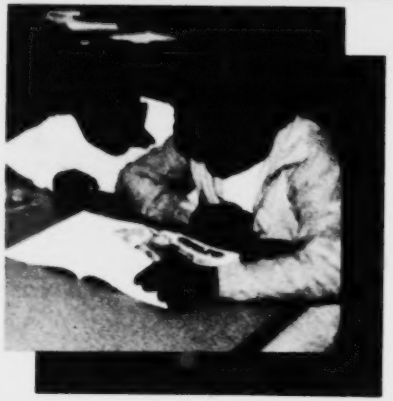

WATER EDUCATION CURRICULA: A COMPENDIUM

Prepared by the
Office of Water Conservation

September 1986

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Secretary for Resources
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FOREWORD

The Department of Water Resources Water Education Program promotes water education in the schools by assisting water agency staff with in-school programs and by making water education curriculum materials available to teachers. Educators agree that water is a critical issue in our world today and should be a vital part of students' education.

Professor Jon. K. Hooper of California State University, Chico conducted a study among educators to determine the extent to which environmental education is being taught in the classrooms. He found that one of the obstacles to teaching environmental education was teachers' lack of access to good instructional materials. Teachers were either unaware of their existence or did not know how to obtain them. Especially cognizant of the need to make water education materials more accessible to teachers, and aware of the many excellent water education materials available, we set out to bring together a collection of the most useful materials in one reference publication--*Water Education Curricula: A Compendium.*

The *Compendium* will be a useful reference for school teachers, curriculum specialists, and science coordinators. It should also be helpful to water agency personnel in conducting water education programs in their service areas.

We hope that providing water agencies and schools with the practical tools for water education will in turn enhance our students' appreciation for our precious water resources.

Suzanne Butterfield, Chief
Office of Water Conservation
Department of Water Resources

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TABLE 1

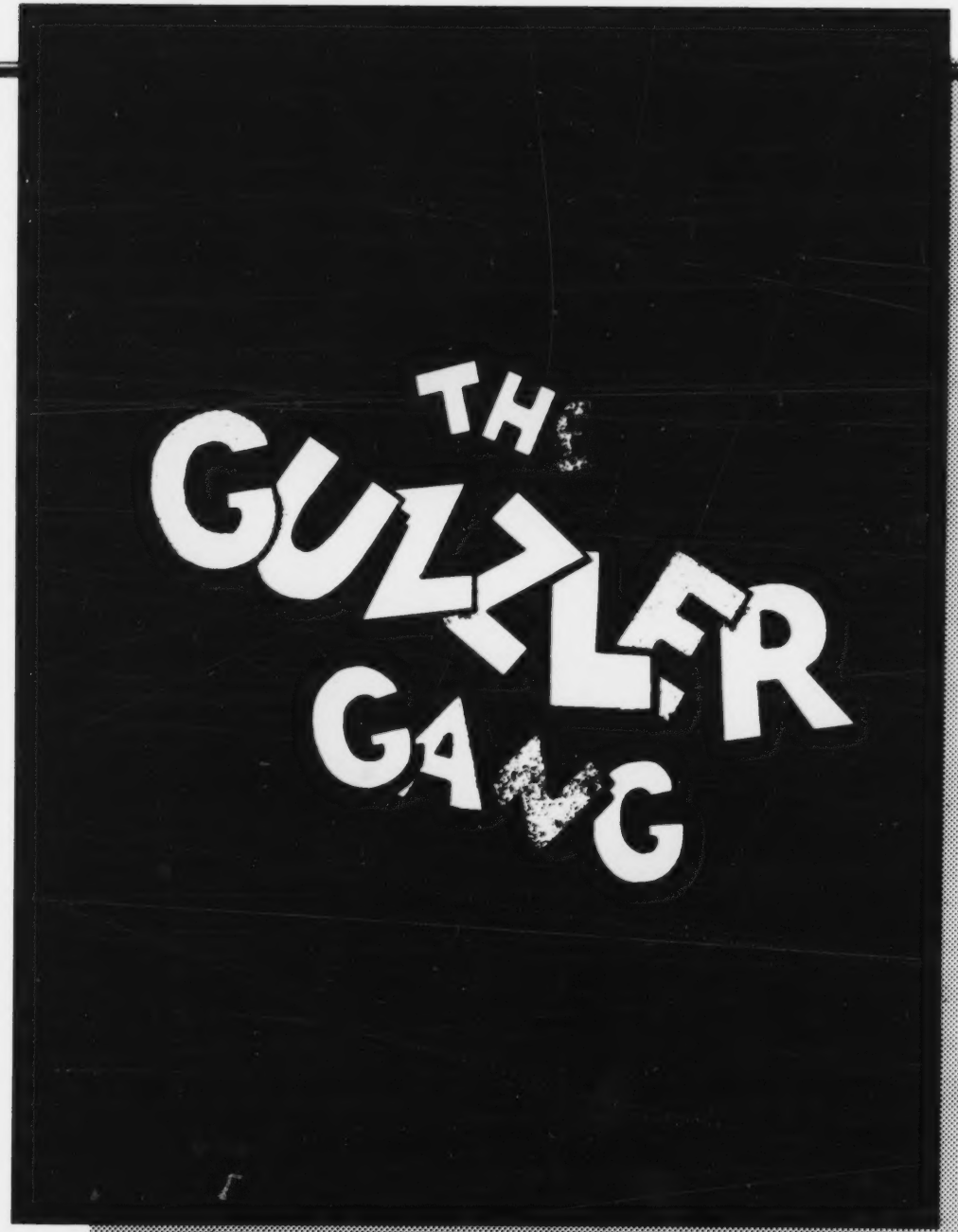
Curriculum Referenced to Science Framework Addendum [1/]

Curriculum Title	Target Grades	Science Areas	Concepts (Concept Numbers - See Appendix A)
The Guzzler Gang	K-3	Biological, Earth	2,25,26
Water Fur	K-3	Biological, Earth, Physical	14,20,25,26,37,42
Water Play	K-3	Biological, Earth	2,14,20,25,29
Water is Your Best Friend	K-3	Biological, Earth, Physical	2,12,14,25,26,29,37,42
Water is Peter's Best Friend- A Flannel Board Story	K-2	Biological, Earth, Physical	2,12,14,18,20,25,29,37,42
The Water Cycle	1-2	Biological, Earth, Physical	2,20,29,37,42
Peter's Magical Water Journey - A Flannel Board Story	2-4	Biological, Earth, Physical	2,12,14,18,20,25,29,37,42
Travelling with Ricki the Rainbunctious Raindrop	3	Earth, Physical	25,26,27,42
Admiral Splash	4	Biological, Earth, S.T.I.S. [2/]	2,10,20,23,24,25,26,31,33, 34,37,48
The California Water Works and Why it Does....	3-8	Biological, Earth, Physical	10,20,24,25,26,29,31,34,35, 37,43,49
The Tardy Twins Meet Polluto	4-6	Biological, Earth	8,18,26,27,28,49
Water for Ursa	6	Biological, Earth, Physical	2,14,18,23,24,25,26,27,28,31, 34,37,40,43,44,48,49

A Journey Down the Colorado River Aqueduct	3-9	Biological, Earth	14,24,25,26,49
Be Water-Wise	7	Biological, Earth	2,10,14,18,20,24,25,26,37,48,49
The Official Captain Hydro Water Conservation Workbook	5-8	Biological, Earth, Physical	14,18,20,21,25,29,37,43,48,49
Water Lifelines for Los Angeles	5-9	Earth, Physical	24,25,26,37,48,49
The Further Adventures of Captain Hydro	7-8	Biological, Earth	2,14,24,25,28,49
The California Water Map Program	7-8	Biological, Earth	2,14,18,21,25,26,29,40,49
The Delta Dilemma - Simulation Unit	9-12	Biological, Earth	2,9,10,14,15,16,18,21,24,25 26,29,40,48,49
Project Water Science	10-12	Biological, Earth	2,3,8,16,18,21,22,23,24,25,26,27,29,37,40,48,49
A Sense of Water	K-12	Biological, Earth, Physical	1,2,7,8,9,10,12,14,15,18,21,22,25,26,28,34,35,36,37,38,39,41,42,43,48,49
Regional Teacher's Guide Supplement	K-12	Biological, Earth	2,14,21,25,26
The Story of Drinking Water	1-9	Biological, Earth	2,10,14,15,18,21,25,26,29,34,35,36,37,38,40,41,42,43,48,49

1/ California State Department of Education, Science Framework Addendum for California Public Schools, 1984. Expectations for Learner's Achievements in Science - A Model.

2/ S.T.I.S. - Concepts related to Science, Technology, Individuals, and Society.



Permission to use this material granted by The Metropolitan Water District of Southern California (MWD).

The Guzzler Gang

Grade level: K-3

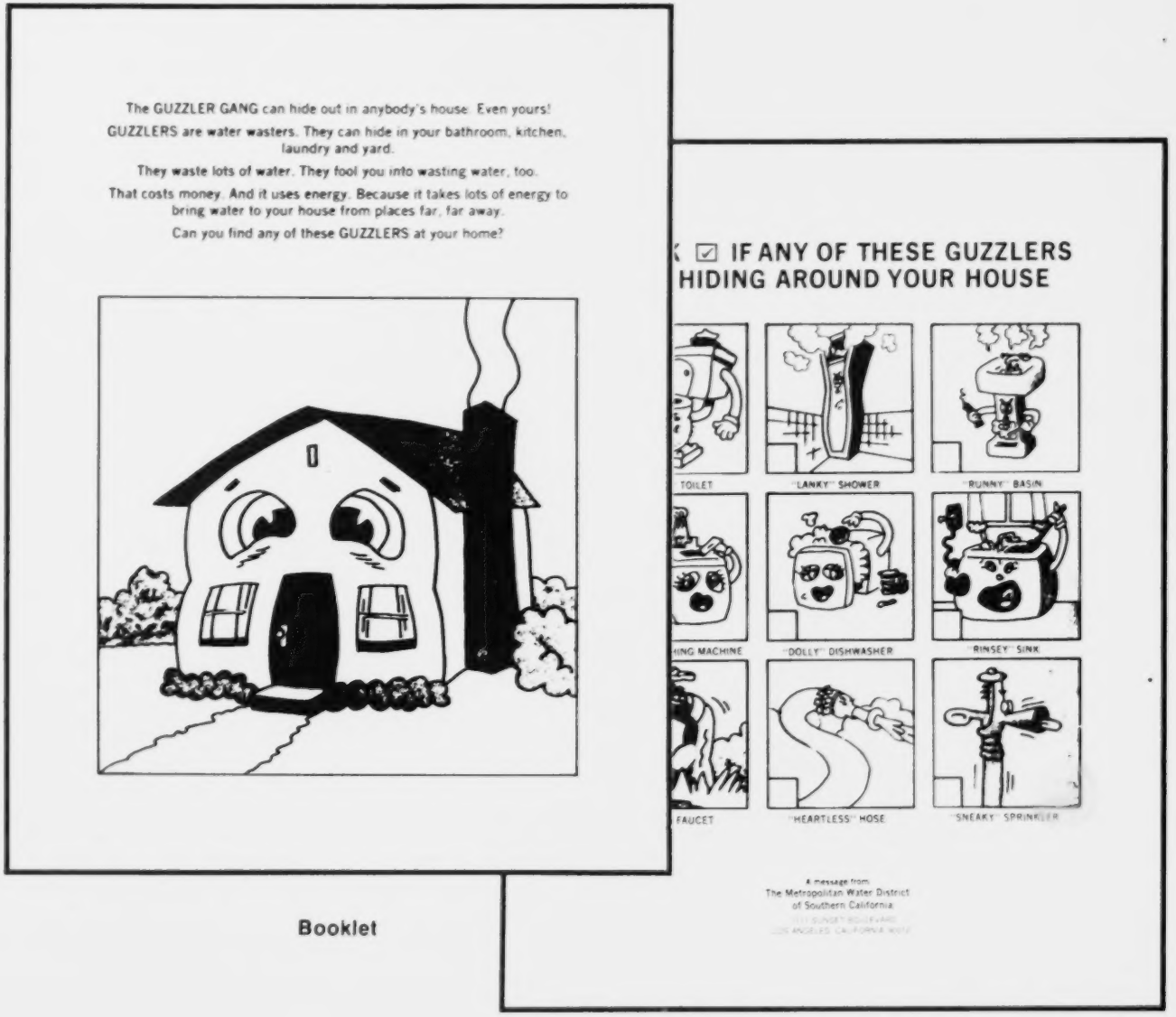
Cost: Free to teachers in the MWD service area. One free sample brochure to others.

Available from:
Education Coordinator
The Metropolitan Water District
of Southern California
Public Information Division
1111 Sunset Boulevard
Los Angeles, CA 90054
(213) 250-6739

Description:

The Guzzler Gang is a comic book about a group of household culprits that waste water. Animated appliances with bad habits include "Whiney" toilet, "Dolly" dishwasher, and "Sneaky" sprinkler. In this colorful booklet, students are challenged to identify the water wasters in their homes and to stop them.

The Guzzler Gang could be the basis for one or two clear and practical classroom discussions on household water conservation techniques. Since the booklet essentially promotes awareness of water use, it is a good introduction for small children.


The GUZZLER GANG can hide out in anybody's house. Even yours!
GUZZLERS are water wasters. They can hide in your bathroom, kitchen, laundry and yard.
They waste lots of water. They fool you into wasting water, too.
That costs money. And it uses energy. Because it takes lots of energy to bring water to your house from places far, far away.
Can you find any of these GUZZLERS at your home?
IF ANY OF THESE GUZZLERS
HIDING AROUND YOUR HOUSE
TOILET
"LANKY" SHOWER
"RUNNY" BASIN
"DOLLY" DISHWASHER
RINSEY" SINK
FAUCET
"HEARTLESS" HOSE
"SNEAKY" SPRINKLER
A message from
The Metropolitan Water District
of Southern California

Booklet

Permission to use this material granted by Los Angeles Department of Water and Power.

Water Fun

Copyright 1982

Grade level: K-3

Cost: Free to teachers in the City of Los Angeles. Others contact the Department of Water Resources for ordering information.

Available from:
Educational Services
Los Angeles Department
of Water and Power
P.O. Box 111, Room 1509
Los Angeles, CA 90051
(213) 481-4169

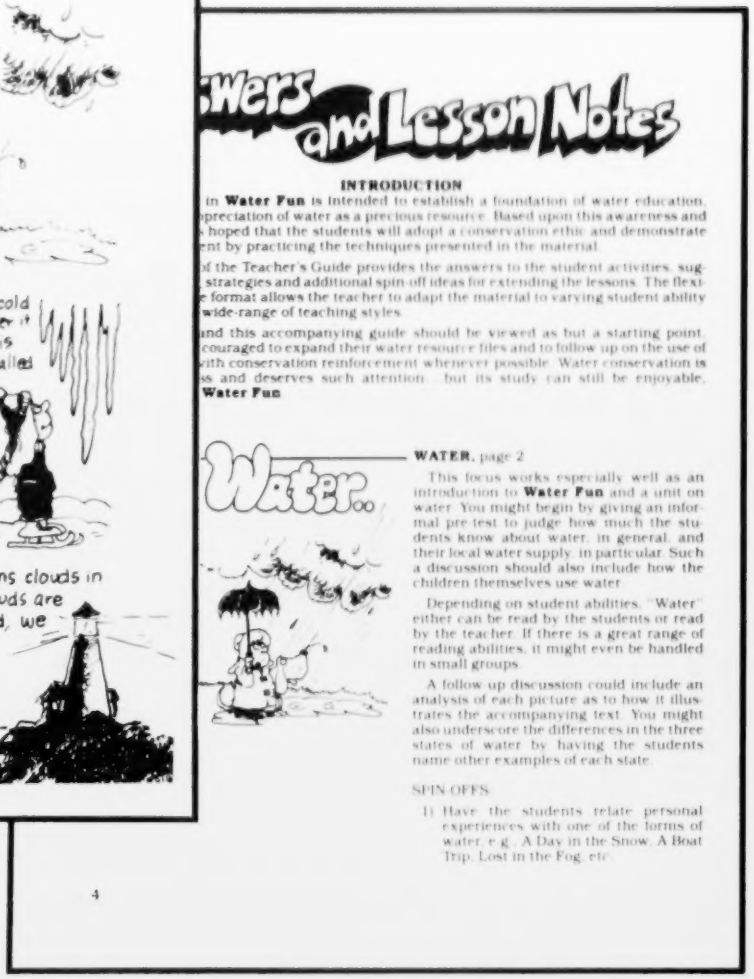
Description:

Water Fun is a colorful booklet featuring a variety of exercises and puzzles that will make children more aware of water. The water cycle is presented through a simple classroom experiment. A story is told about caveman Grok who discovered that water was important for cleanliness. Also included in Water Fun are water-centered exercises that would make interesting math, art, or language arts lessons. Students will have fun singing the "Song of Water" while learning to use water resources wisely.

The teacher's guide has background information, a glossary, and suggestions for classroom activities to accompany the lessons. The teacher may conduct several classroom lessons using the student booklet or allow students to work in the booklets independently.

Water...
We see water in lakes and rivers, pools and ponds, puddles and oceans. We need water to cook, wash, drink and swim. We use pipes to bring water to our faucets.
Water falls from the sky as a liquid. We call it rain.
Sometimes water freezes in the sky and falls to earth in tiny flakes. Then we call it snow.
Water can get so cold that it freezes after it falls to earth. This frozen water is called ice.
When water gets hot enough, it turns into a mist called vapor. The vapor that comes from boiling water is called steam.
Water vapor forms clouds in the sky. When clouds are close to the ground, we call it fog.

Student Workbook


swers and Lesson Notes
INTRODUCTION
in Water Fun is intended to establish a foundation of water education.
preciation of water as a precious resource. Based upon this awareness and
s hoped that the students will adopt a conservation ethic and demonstrate
ent by practicing the techniques presented in the material.
f the Teacher's Guide provides the answers to the student activities, sug-
strategies and additional spin-off ideas for extending the lessons. The flexi-
format allows the teacher to adapt the material to varying student ability
wide-range of teaching styles.
nd this accompanying guide should be viewed as but a starting point.
couraged to expand their water resource files and to follow up on the use of
ith conservation reinforcement whenever possible. Water conservation is
ss and deserves such attention... but its study can still be enjoyable.
Water Fun
Water...
WATER, page 2
This focus works especially well as an introduction to Water Fun and a unit on water. You might begin by giving an informal pre-test to judge how much the students know about water, in general, and their local water supply, in particular. Such a discussion should also include how the children themselves use water.
Depending on student abilities, "Water" either can be read by the students or read by the teacher. If there is a great range of reading abilities, it might even be handled in small groups.
A follow up discussion could include an analysis of each picture as to how it illustrates the accompanying text. You might also underscore the differences in the three states of water by having the students name other examples of each state.
SPIN-OFFS
1) Have the students relate personal experiences with one of the forms of water, e.g., A Day in the Snow, A Boat Trip, Lost in the Fog, etc.
4

Teacher's Guide

Permission to use this material granted by East Bay Municipal Utility District.

Water Play

Copyright 1976

Grade level: K-3

Cost: Free to teachers in East Bay MUD service area. Others contact the Department of Water Resources for ordering information.

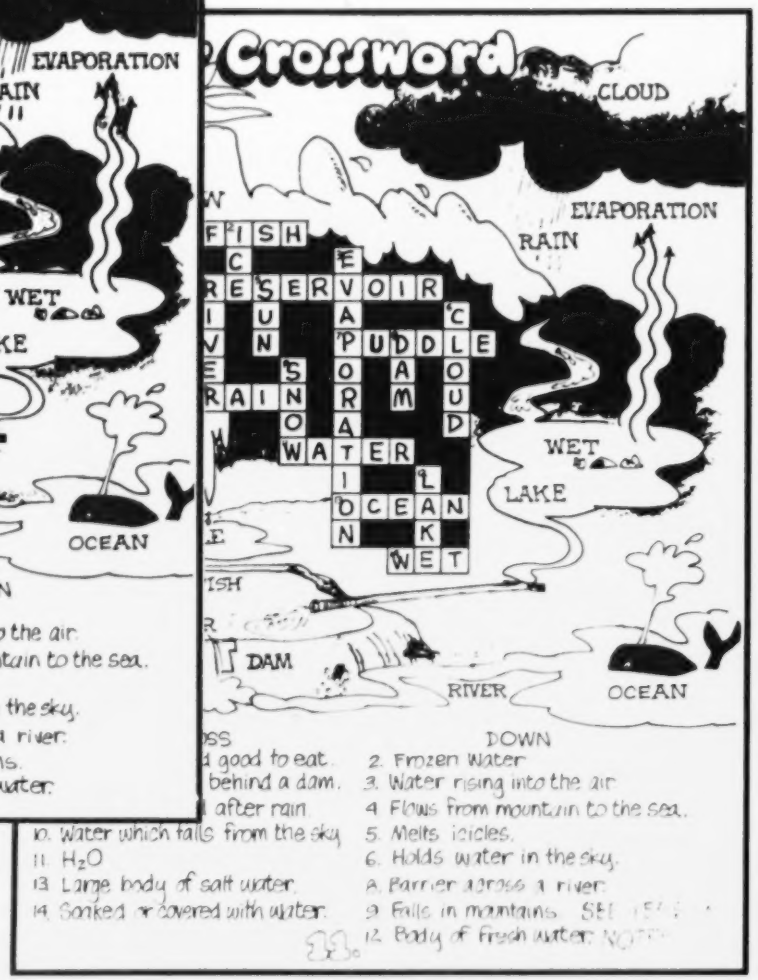
Available from:
East Bay Municipal Utility District
P. O. Box 24055
Oakland, CA 94623
(415) 891-0615

Description:

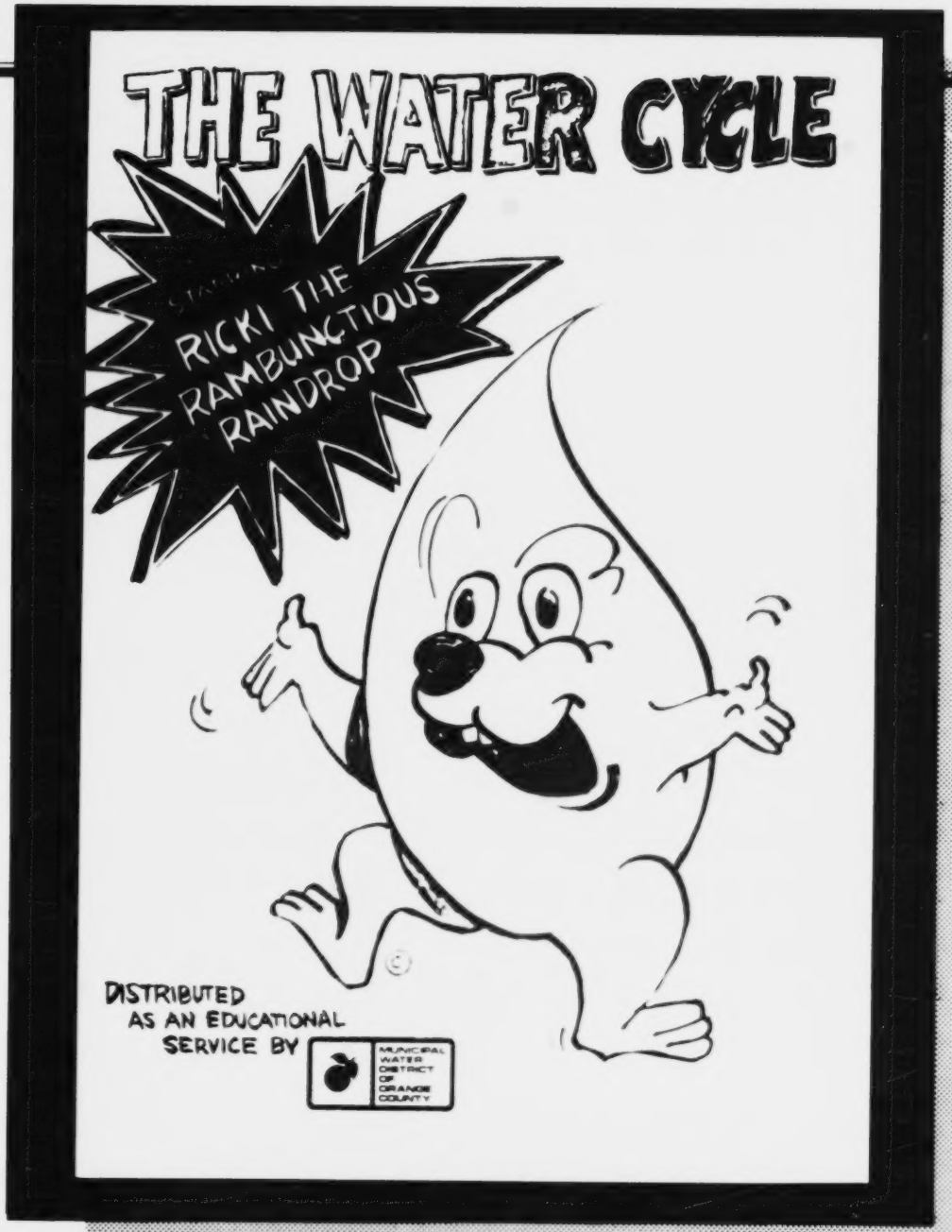
Water Play is a colorful booklet that presents water concepts in an enthusiastic fashion. Exercises, in a variety of curricular areas, encourage growth in the cognitive and affective domains. Water ideas are presented through word sounds, spelling, and through drawing games and other fun projects. Activities include a poem, a story, a math exercise, and a song.

The workbook is appropriate for kindergarten through 3rd grade; however, a few lessons involving vocabulary may be too advanced for the earliest grades. The teacher's guide not only provides a key to each exercise but also supplies a list of "zinger" activities which are natural spin-offs from the exercise. The guide also has resource ideas for field trips and speakers and a water bibliography.

Student Workbook



Teacher's Guide


THE WATER CYCLE
RICKI THE RAMBUNCTIOUS RAINDROP
DISTRIBUTED AS AN EDUCATIONAL SERVICE BY
MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

Permission to use this material granted by Municipal Water District of Orange County.

The Water Cycle

Copyright 1979

Grade level: 1-2

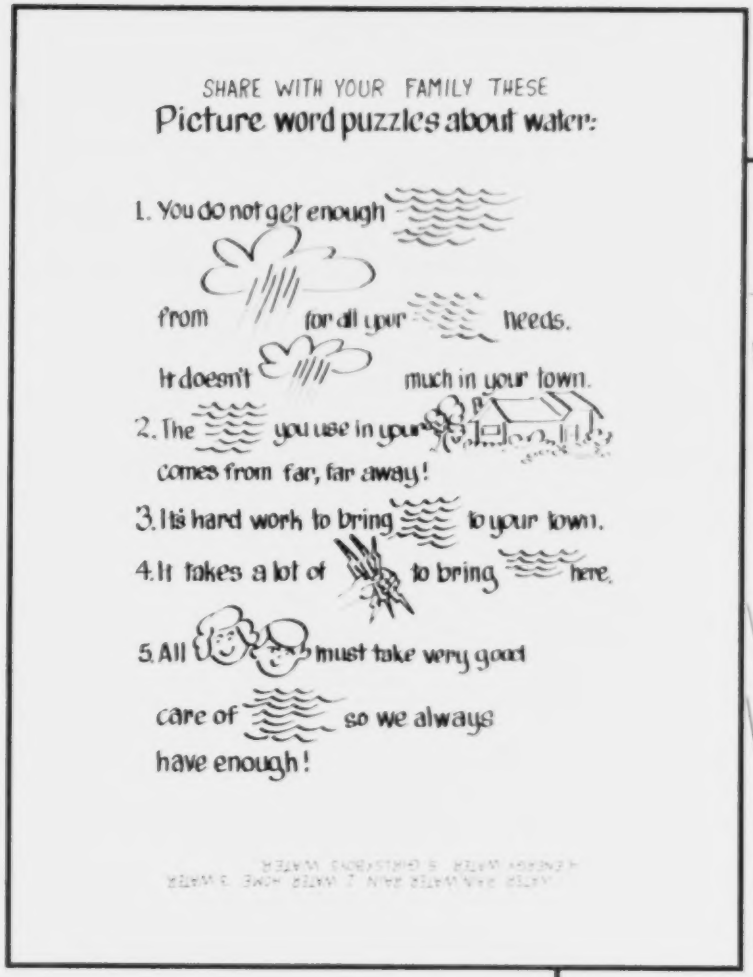
Cost: One copy free.

Available from:
Municipal Water District
of Orange County
P. O. Box 15229
Santa Ana, CA 92705
(714) 973-1023

Description:

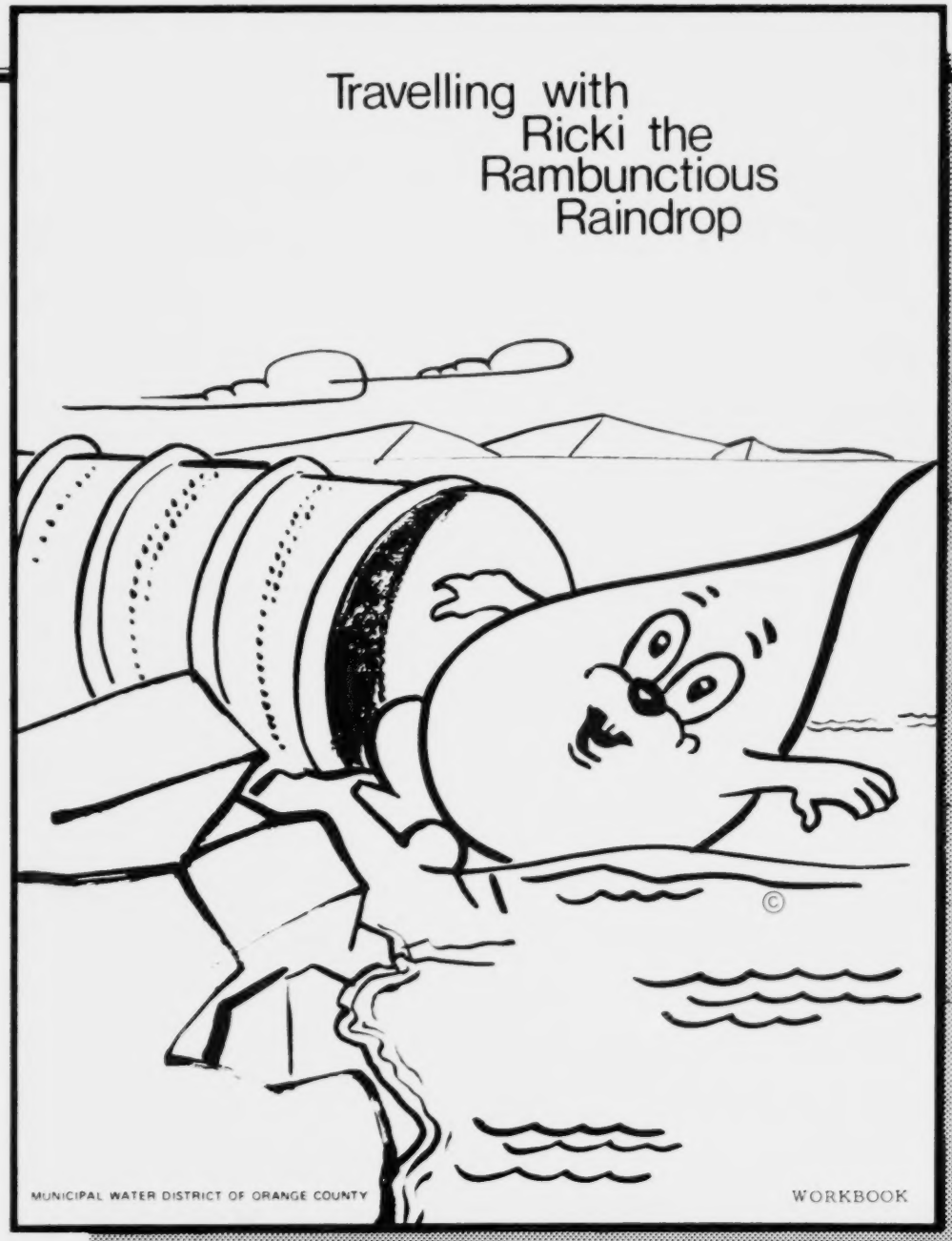
The Water Cycle is a coloring book which features Ricki the Rambunctious Raindrop and gives basic information about the water cycle for younger children. In the coloring book, Ricki takes a few trips through the water cycle. He falls as rain, soaks into the ground, and waters a tree; another time he becomes runoff. Children may be able to identify with Ricki and his experiences to better understand the water cycle.

The Municipal Water District of Orange County uses the book in conjunction with an educational slide presentation, but the curriculum can stand alone.



Coloring Book

When Ricki got home he drew a picture of the water cycle to share with his family and friends.



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Municipal Water District of Orange County.

Travelling with Ricki the Rambunctious Raindrop

Copyright 1976, Revised 1979

Grade level: 3

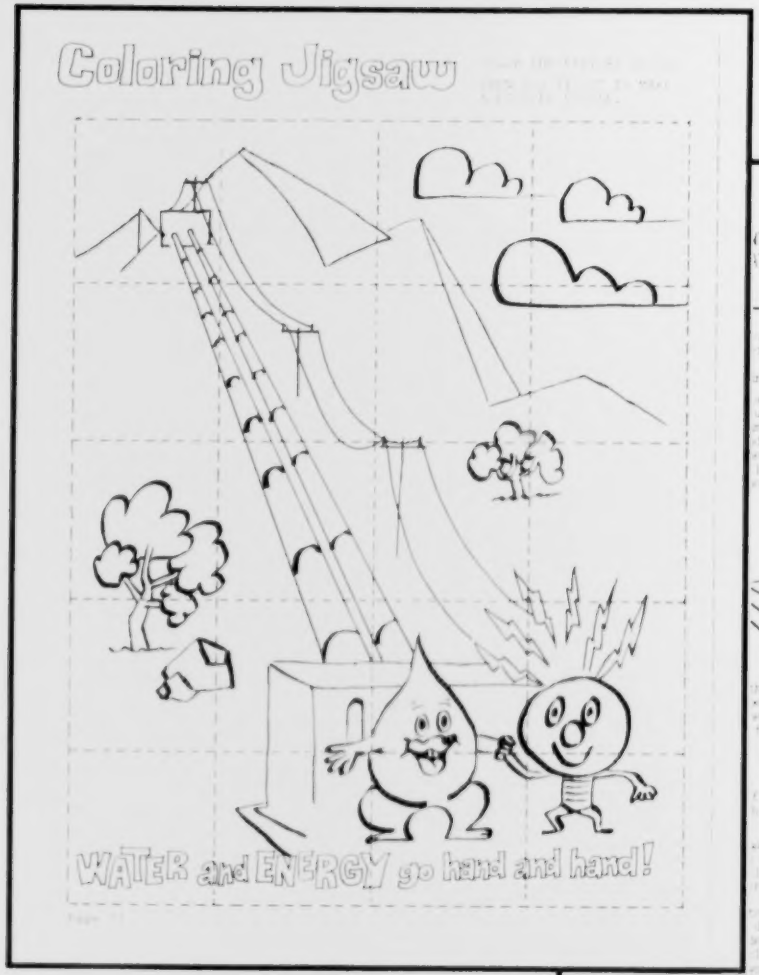
Cost: One copy free.

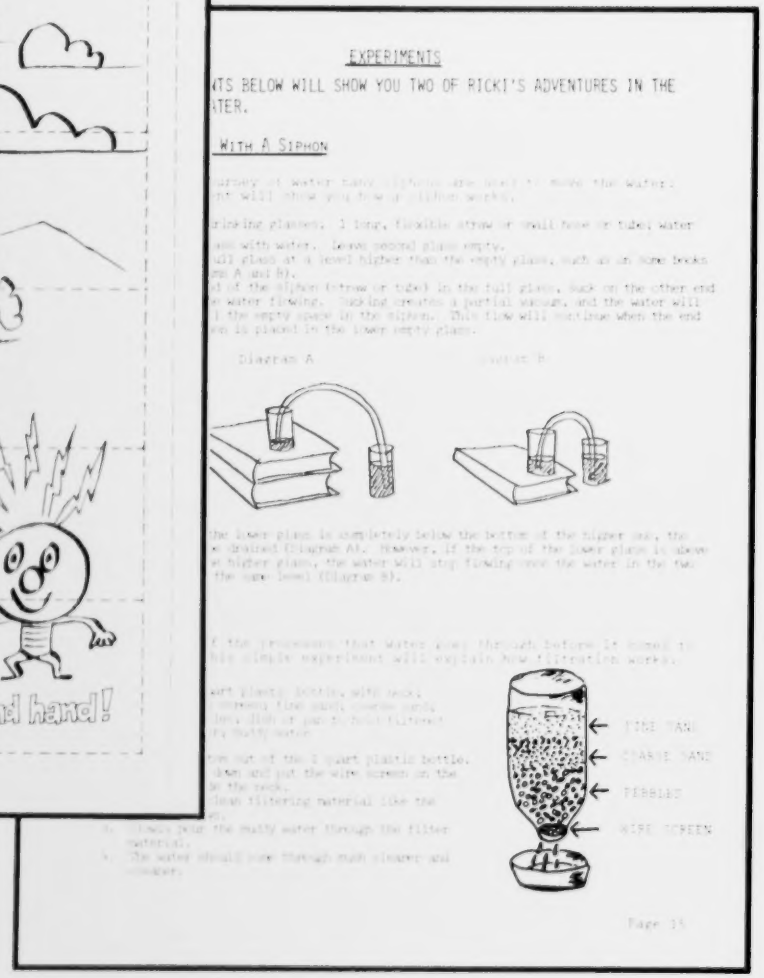
Available from:
Municipal Water District
of Orange County
P. O. Box 15229
Santa Ana, CA 92705
(714) 973-1023

Description:

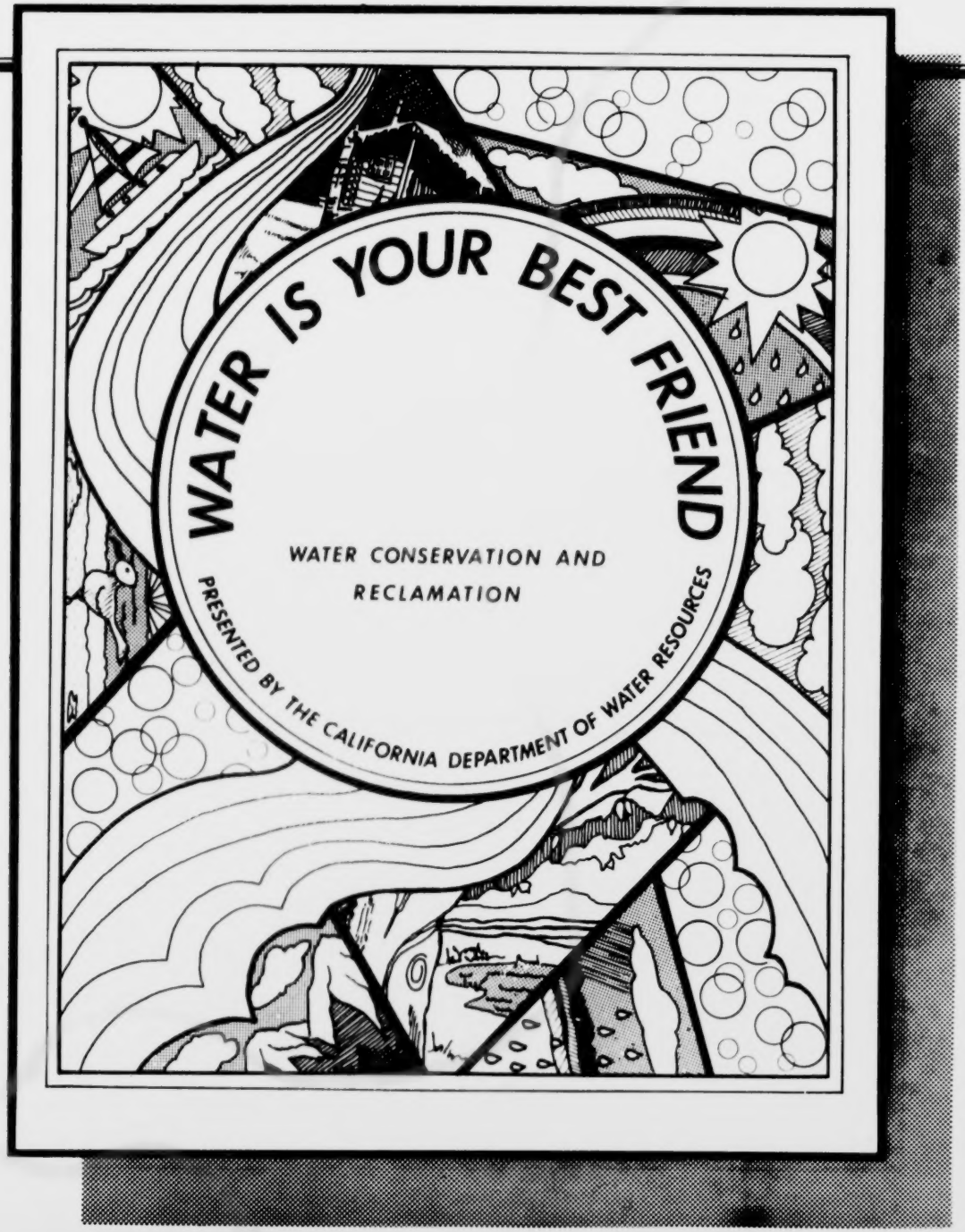
Travelling With Ricki the Rambunctious Raindrop provides classroom activities which promote awareness of water supply and wise use. Workbook activities include puzzles, coloring exercises, and simple experiments. The introduction tells the water story as it follows Ricki the Rambunctious Raindrop's passage through the water cycle into Southern California. A Water Conservation Certificate is also provided.

The workbook usually supplements a slide presentation given by Municipal Water District within its service area.





Student Workbook


WATER IS YOUR BEST FRIEND
WATER CONSERVATION AND
RECLAMATION
PRESENTED BY THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

This material developed by Elizabeth Hone and Geraldine Thompson under contract with the California Department of Water Resources.

Water is Your Best Friend

Published 1982

Grade level: K-3

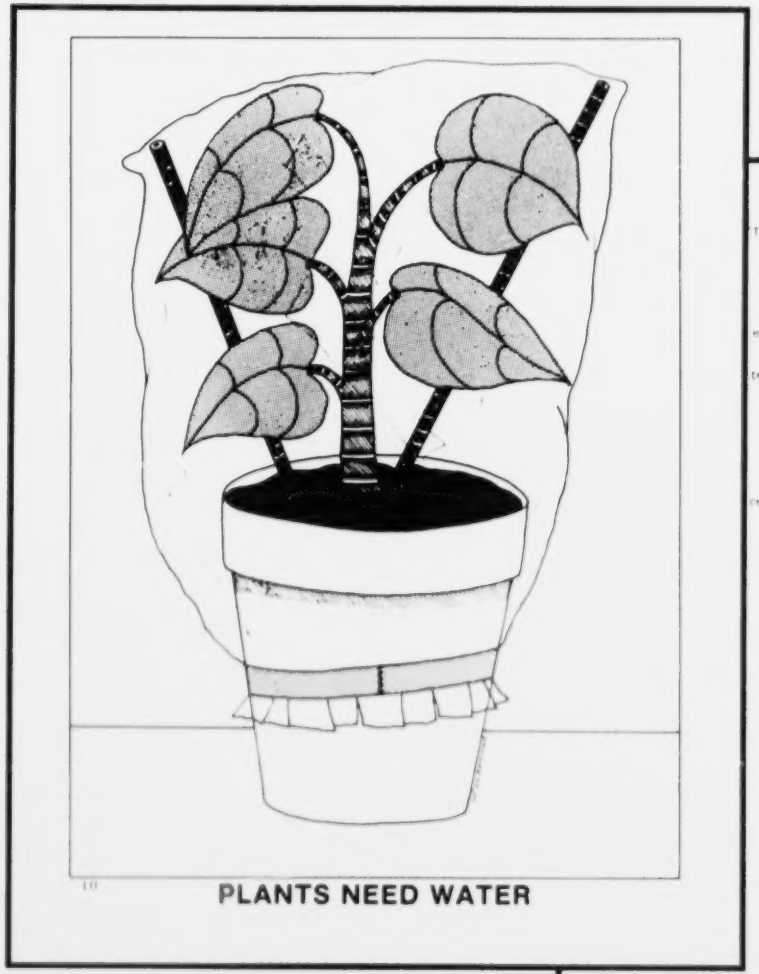
Cost: One copy free. Classroom sets are provided after teacher training.

Available from:
Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001
(916) 322-3070

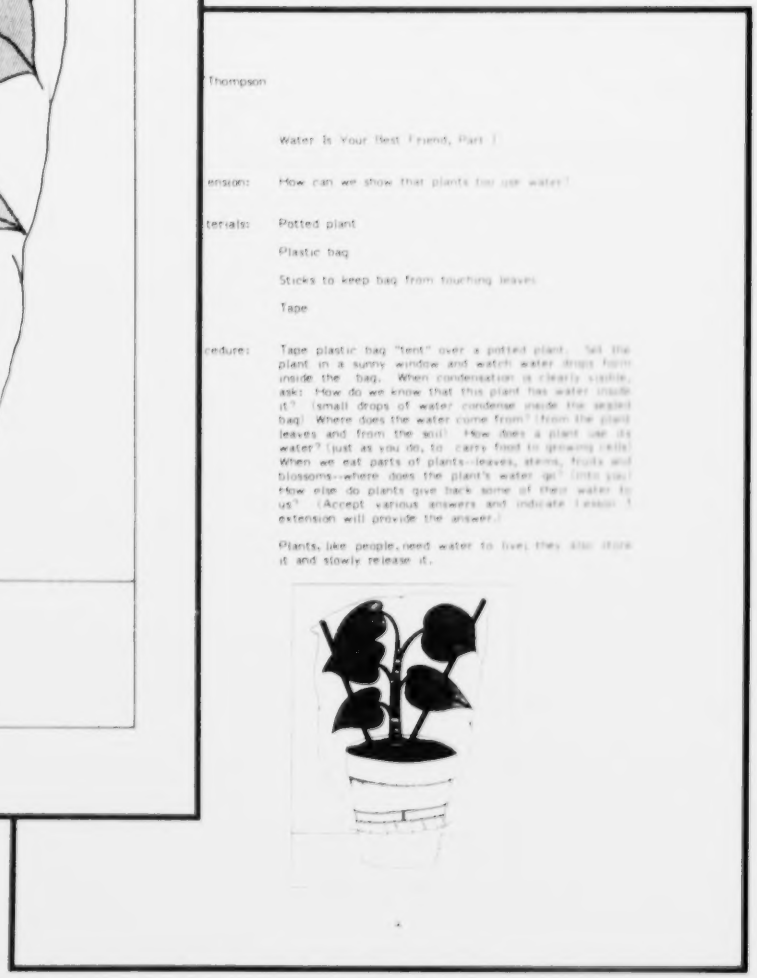
Description:

Water is Your Best Friend teacher's guide includes a series of simple scientific experiments, a schematic map of California's water resources, and a water cycle poster. Children's awareness of water is developed through lessons ranging from the personal need for water and properties of water to water conservation and reclamation. Lessons are designed for incremental, hands-on learning experiences. This curriculum may be used strictly as a science unit or may be interwoven with other areas such as art, math, language arts, or social studies.

The Water is Your Best Friend Coloring Book has illustrations taken from the teacher's guide; these and the posters included in the teacher's guide make interesting art projects which reinforce water concepts.



Coloring Book


Thompson

Water Is Your Best Friend, Part I

ension: How can we show that plants too use water?

terials: Potted plant

Plastic bag

Sticks to keep bag from touching leaves

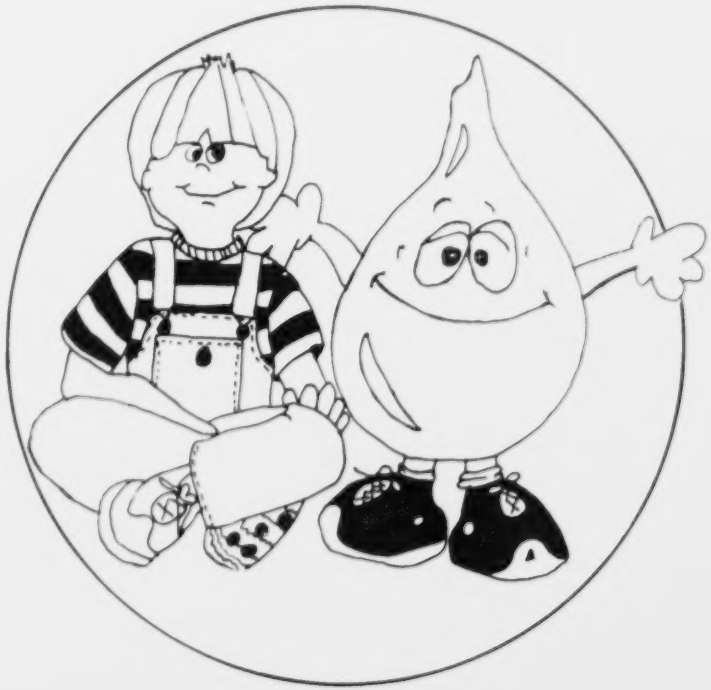
Tape

cedure: Tape plastic bag "tent" over a potted plant. Set the plant in a sunny window and watch water drops form inside the bag. When condensation is clearly visible, ask: How do we know that this plant has water inside it? (small drops of water condense inside the sealed bag) Where does the water come from? (from the plant leaves and from the soil) How does a plant use its water? (just as you do, to carry food to growing cells) When we eat parts of plants--leaves, stems, fruits and blossoms--where does the plant's water go? (into you) How else do plants give back some of their water to us? (Accept various answers and indicate Lesson 1 extension will provide the answer.)

Plants, like people, need water to live; they also store it and slowly release it.

Teacher's Guide

Water is Peter's Best Friend
A Flannel Board Story



Grade Level K-2

A Supplement to Water Is Your Best Friend

Permission to use this material granted by
City of Riverside Public Utilities Department
and Western Municipal Water District.

Water is Peter's Best Friend
A Flannel Board Story

Grade level: K-2

Cost: One copy free.

Available from:
Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001
(916) 322-3070

Description

Concepts for this story are drawn from the California Department of Water Resources publication Water is Your Best Friend. The flannel board story includes a script, a teacher vocabulary list, and directions for making the flannel board and characters using flannel, poster board, glue, and felt pens. While reading the script, the teacher moves the characters around on the flannel board to illustrate a story about Willy the Water Droplet and the nature and uses of water. Children enjoy flannel board stories and are quite attentive to this type of presentation.

(A FLANNEL BOARD STORY)
20 MINUTES

LITTLE PETER LOVED WATER! HE SAW IT EVERYWHERE - IN LAKES AND STREAMS AND OCEANS, IN THE RAIN, AND IN SNOW AND ICE AND STEAM. BUT HE REALLY DIDN'T KNOW JUST HOW IMPORTANT WATER REALLY WAS. DO YOU KNOW HOW IMPORTANT WATER REALLY IS? WATER HELPS THE PLANTS FOR YOUR FOOD TO GROW, AND WATER ALSO KEEPS YOU FROM GETTING THIRSTY. WITHOUT WATER, YOU COULDN'T LIVE! PETER WANTED TO LEARN A LOT MORE ABOUT WATER, SO ONE DAY HE SET OUT TO FIND HIS BEST FRIEND WILLY THE WATER DROP, WHO COULD TELL HIM ALL ABOUT WATER. HE LOOKED HIGH AND LOW, AND ONE DAY FOUND WILLY IN A PUDDLE ON THE SCHOOL PLAYGROUND!

"HI WILLY!" SAID PETER. "WILL YOU TELL ME WHY WATER IS MY BEST FRIEND?"

"SURE," SAID WILLY! "DID YOU KNOW THAT YOU HAVE WATER IN YOUR BODY? YOUR BODY GETS WATER FROM THE FOOD YOU EAT, LIKE APPLES. APPLES HAVE WATER IN THEM, SO WHEN YOU EAT AN APPLE, YOU'RE ALSO EATING WATER! FOOD LIKE MILK, VEGETABLES AND BREAD CONTAIN WATER. AND OF COURSE, WHEN YOU DRINK WATER, YOUR BODY IS STORING THIS WATER UP! YOU KNOW YOU HAVE WATER IN YOUR BODY WHEN YOU HAVE BEEN RUNNING OR PLAYING HARD BECAUSE YOUR BODY SWEATS. THIS IS WATER THAT COMES OUT OF YOUR BODY THROUGH YOUR SKIN TO COOL YOU OFF. THIS IS YOUR NATURAL AIR CONDITIONER!"

"BOY, ON A HOT DAY LIKE THIS, I'M REALLY GLAD I HAVE WATER INSIDE ME!" SAID PETER.

"I BET YOU DO!" LAUGHED WILLY. "WATER IS HELPFUL TOO, BECAUSE WE CAN USE WATER TO CLEAN THINGS. FIRST OF ALL, WATER CAN CLEAN THE INSIDE OF OUR BODIES. WHAT HAPPENS WHEN DUST GETS IN YOUR EYES?"

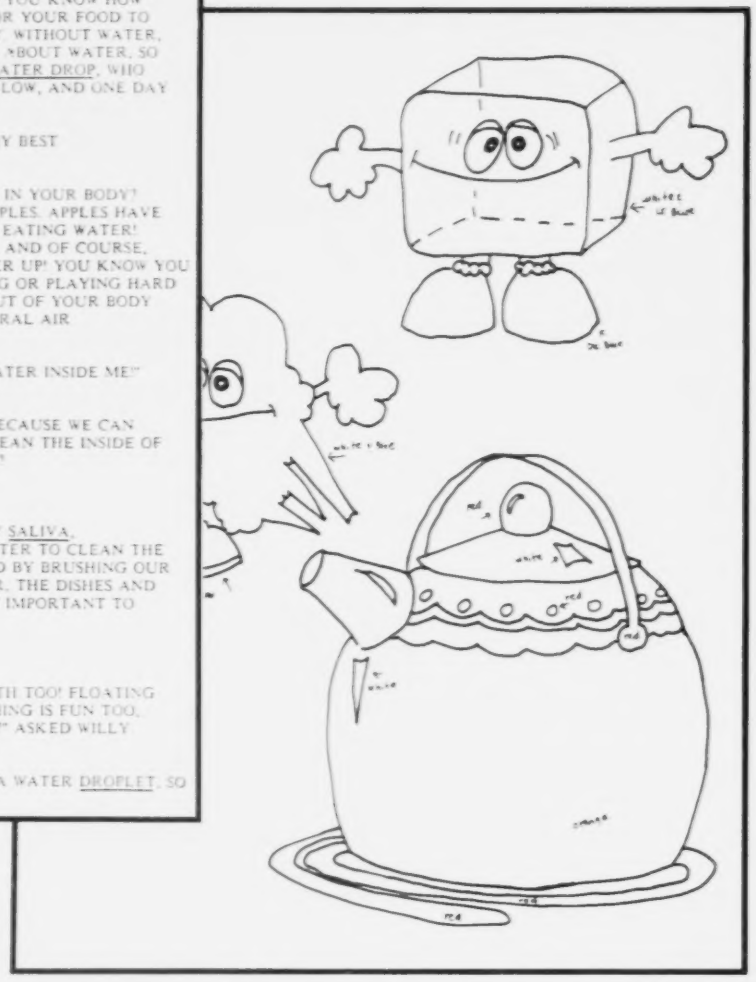
"MY EYES WATER," SAID PETER.

"WATER ALSO HELPS TO CLEAN THE INSIDE OF YOUR BODY BY SALIVA, PERSPIRATION, AND WASTES," CONTINUED WILLY. "WE USE WATER TO CLEAN THE OUTSIDE OF OUR BODIES BY TAKING SHOWERS OR BATHS, AND BY BRUSHING OUR TEETH. WE ALSO CLEAN OUR WINDOWS AND FLOORS, THE CAR, THE DISHES AND CLOTHES, ALL BY USING WATER. SO YOU SEE, WATER IS VERY IMPORTANT TO ALL OF US!"

"I USE WATER TO WASH MY DOG, TOO!" PETER ADDED.

"WATER IS NOT ONLY IMPORTANT, BUT IT IS FUN TO PLAY WITH TOO! FLOATING ON AN INNERTUBE IN A POND OR RIVER IS LOTS OF FUN. FISHING IS FUN TOO, AND YOU NEED WATER TO DO THESE ACTIVITIES, DON'T YOU?" ASKED WILLY. "SEE, WATER IS YOUR BEST FRIEND!"

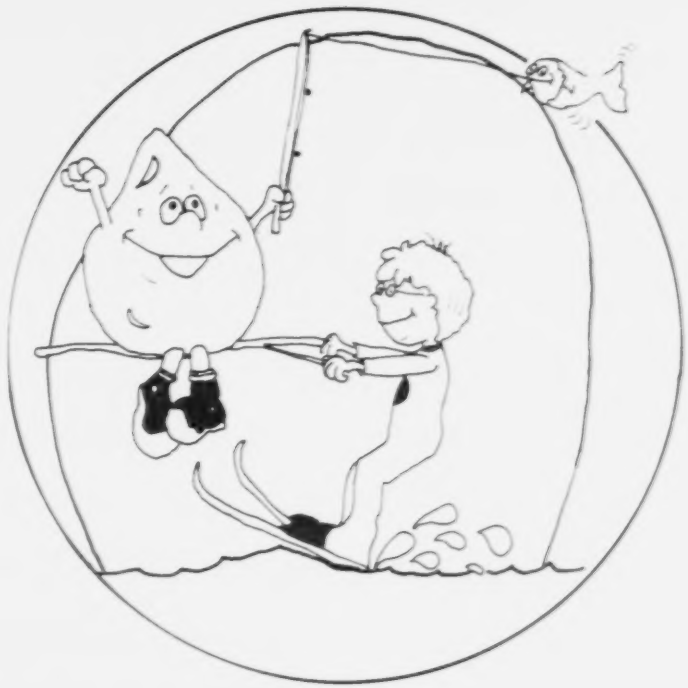
"DID YOU KNOW THAT WATER WEARS THREE COSTUMES? I'M A WATER DROPLET, SO



Teacher's Guide

Peter's Magical Water Journey

A Flannel Board Story



Grade Level 2-4

A Supplement to Water Is Your Best Friend

Permission to use this material granted by
City of Riverside Public Utilities Department
and Western Municipal Water District.

Peter's Magical Water Journey
A Flannel Board Story

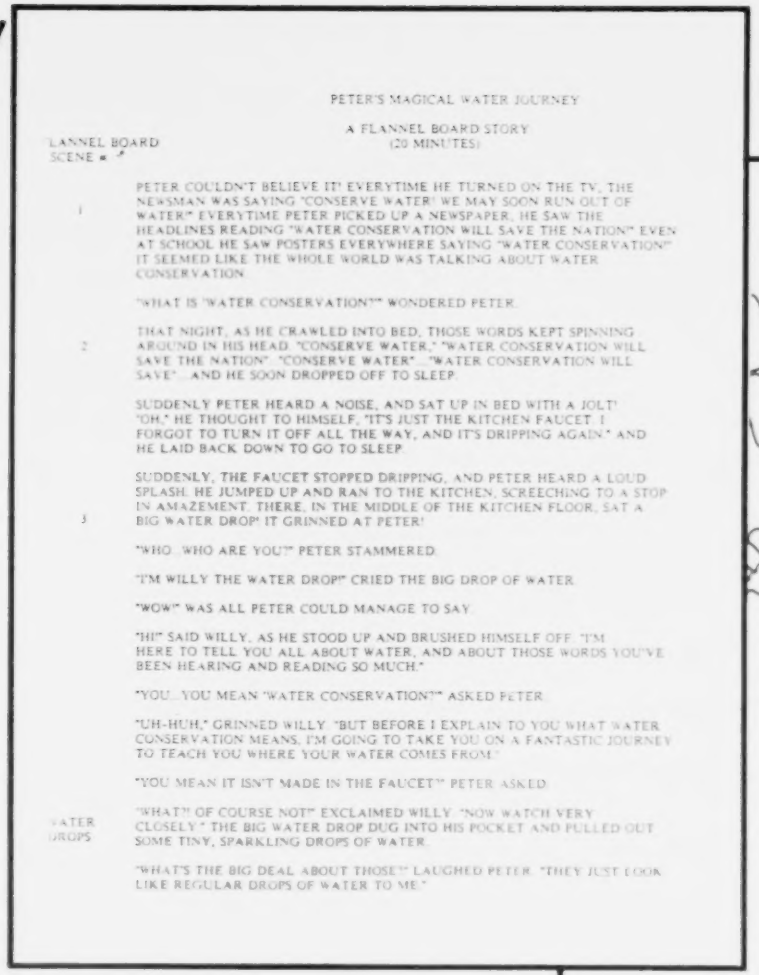
Grade Level: 2-4

Cost: One copy free.

Available from:
Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001
(916) 322-3070

Description

Peter's Magical Water Journey is an advanced version of Water Is Peter's Best Friend. In this story, Peter is older and is escorted on a magical water journey by his friend, Willy the Water Droplet. The concepts learned in Water Is Peter's Best Friend are expanded upon. More cutout versions of each character and visual action have been added to the story. The flannel board story includes a script, a teacher vocabulary list, and directions for making the flannel board and characters. Concepts for this story are drawn from the California Department of Water Resources publication Water Is Your Best Friend.



PETER'S MAGICAL WATER JOURNEY

A FLANNEL BOARD STORY
(20 MINUTES)

FLANNEL BOARD SCENE # 1

PETER COULDN'T BELIEVE IT! EVERYTIME HE TURNED ON THE TV, THE NEWSMAN WAS SAYING "CONSERVE WATER! WE MAY SOON RUN OUT OF WATER." EVERYTIME PETER PICKED UP A NEWSPAPER, HE SAW THE HEADLINES READING "WATER CONSERVATION WILL SAVE THE NATION." EVEN AT SCHOOL HE SAW POSTERS EVERYWHERE SAYING "WATER CONSERVATION!" IT SEEMED LIKE THE WHOLE WORLD WAS TALKING ABOUT WATER CONSERVATION.

"WHAT IS 'WATER CONSERVATION?'" WONDERED PETER.

2 THAT NIGHT, AS HE CRAWLED INTO BED, THOSE WORDS KEPT SPINNING AROUND IN HIS HEAD. "CONSERVE WATER," "WATER CONSERVATION WILL SAVE THE NATION", "CONSERVE WATER"... "WATER CONSERVATION WILL SAVE"... AND HE SOON DROPPED OFF TO SLEEP.

SUDDENLY PETER HEARD A NOISE, AND SAT UP IN BED WITH A JOLT! "OH," HE THOUGHT TO HIMSELF, "IT'S JUST THE KITCHEN FAUCET. I FORGOT TO TURN IT OFF ALL THE WAY, AND IT'S DRIPPING AGAIN." AND HE LAID BACK DOWN TO GO TO SLEEP.

SUDDENLY, THE FAUCET STOPPED DRIPPING, AND PETER HEARD A LOUD SPLASH. HE JUMPED UP AND RAN TO THE KITCHEN, SCREECHING TO A STOP IN AMAZEMENT. THERE, IN THE MIDDLE OF THE KITCHEN FLOOR, SAT A 3 BIG WATER DROP! IT GRINNED AT PETER!

"WHO...WHO ARE YOU?" PETER STAMMERED.

"I'M WILLY THE WATER DROP!" CRIED THE BIG DROP OF WATER.

"WOW!" WAS ALL PETER COULD MANAGE TO SAY.

"HI!" SAID WILLY, AS HE STOOD UP AND BRUSHED HIMSELF OFF. "I'M HERE TO TELL YOU ALL ABOUT WATER, AND ABOUT THOSE WORDS YOU'VE BEEN HEARING AND READING SO MUCH."

"YOU...YOU MEAN 'WATER CONSERVATION?'" ASKED PETER.

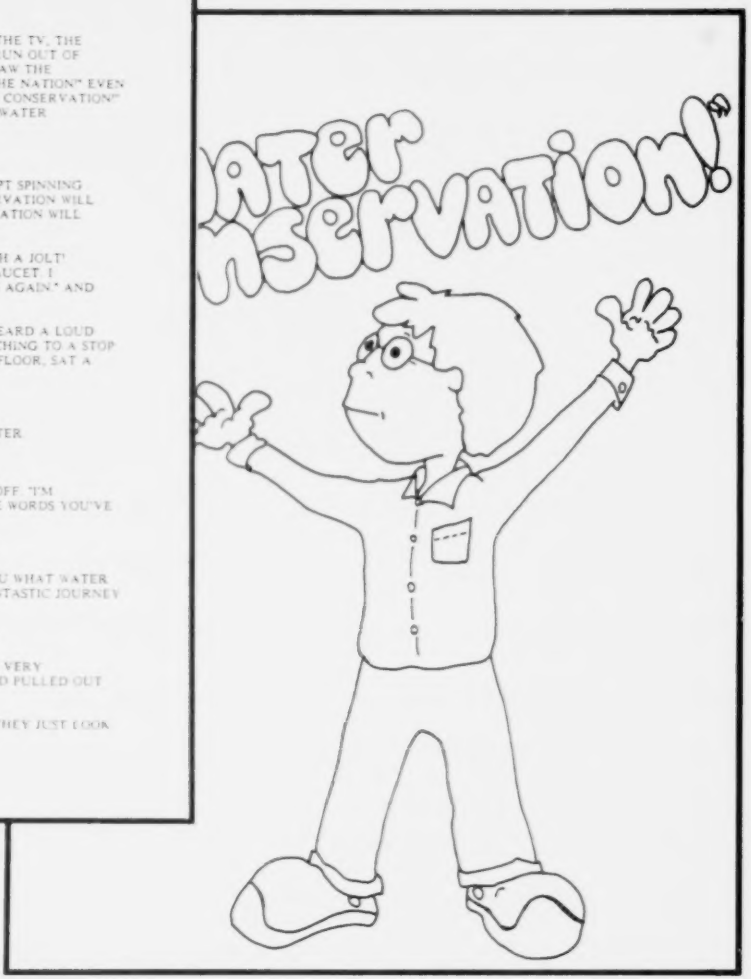
"UH-HUH," GRINNED WILLY. "BUT BEFORE I EXPLAIN TO YOU WHAT WATER CONSERVATION MEANS, I'M GOING TO TAKE YOU ON A FANTASTIC JOURNEY TO TEACH YOU WHERE YOUR WATER COMES FROM."

"YOU MEAN IT ISN'T MADE IN THE FAUCET?" PETER ASKED.

WATER DROPS "WHAT?! OF COURSE NOT!" EXCLAIMED WILLY. "NOW WATCH VERY CLOSELY." THE BIG WATER DROP DUG INTO HIS POCKET AND PULLED OUT SOME TINY, SPARKLING DROPS OF WATER.

"WHAT'S THE BIG DEAL ABOUT THOSE?" LAUGHED PETER. "THEY JUST LOOK LIKE REGULAR DROPS OF WATER TO ME."

Teacher's Guide



A Water Conservation Program from Metropolitan Water District of Southern California

ADMIRAL SPLASH

Name _____

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Admiral Splash

Copyright 1983

Grade level: 4

Cost: Kit free to teachers in MWD service area only. Teacher in-service training is required (consumables resupplied yearly).

Available from:
Education Coordinator
The Metropolitan Water District of Southern California
Public Information Division
1111 Sunset Boulevard
Los Angeles, CA 90054
(213) 250-6739

Description:

Admiral Splash is a complete Water Education Program for 4th grade classes in MWD's service area. The kit includes a filmstrip and audio-cassette, a poster, a teacher's guide, and 35 each of student workbooks, pre- and post-tests, home information sheets, and stickers. The program is designed for ten lessons, each taking about 30 to 45 minutes. Exercises follow each lesson.

The "Admiral" takes the student through the colorful workbook describing the water cycle, history of Southern California's water systems, information about water distribution, uses, and conservation practices. The teacher's guide provides thorough lesson plans. This curriculum demonstrates that learning important water concepts can be a lot of fun.

HISTORY OF WATER SUPPLY IN SOUTHERN CALIFORNIA (Continued)

The Colorado River Aqueduct
1920–1950

The California Aqueduct
1950–present

By the 1920's, Los Angeles and the areas around it had about one million people. And California was suffering from another drought, a time of very little rainfall. William Mulholland went looking for water again. This time he found a supply of water east of Los Angeles at the Colorado River.

Several cities in Southern California became interested in this new supply of water. They formed the Metropolitan Water District so they could build an aqueduct from the Colorado River to Southern California.

The Colorado River Aqueduct was finished in 1939. It is 242 miles long. It goes through and over mountains and across deserts. Water from the Colorado River Aqueduct was first delivered to cities in the Metropolitan Water District in June 1941.

Southern California's warm weather and nice scenery made it a popular place. But every few years, California had another dry spell. The population was growing and so was the need for water.

In 1960, Californians voted to build the State Water Project. The project includes the California Aqueduct. This aqueduct brings water from the rainy north to dry Central and Southern California, as well as to other areas in the state.

The California Aqueduct is the longest aqueduct in the world. It reaches about 450 miles from near Sacramento to Los Angeles and Riverside. By 1972, water from the California Aqueduct was being delivered to cities in Southern California.

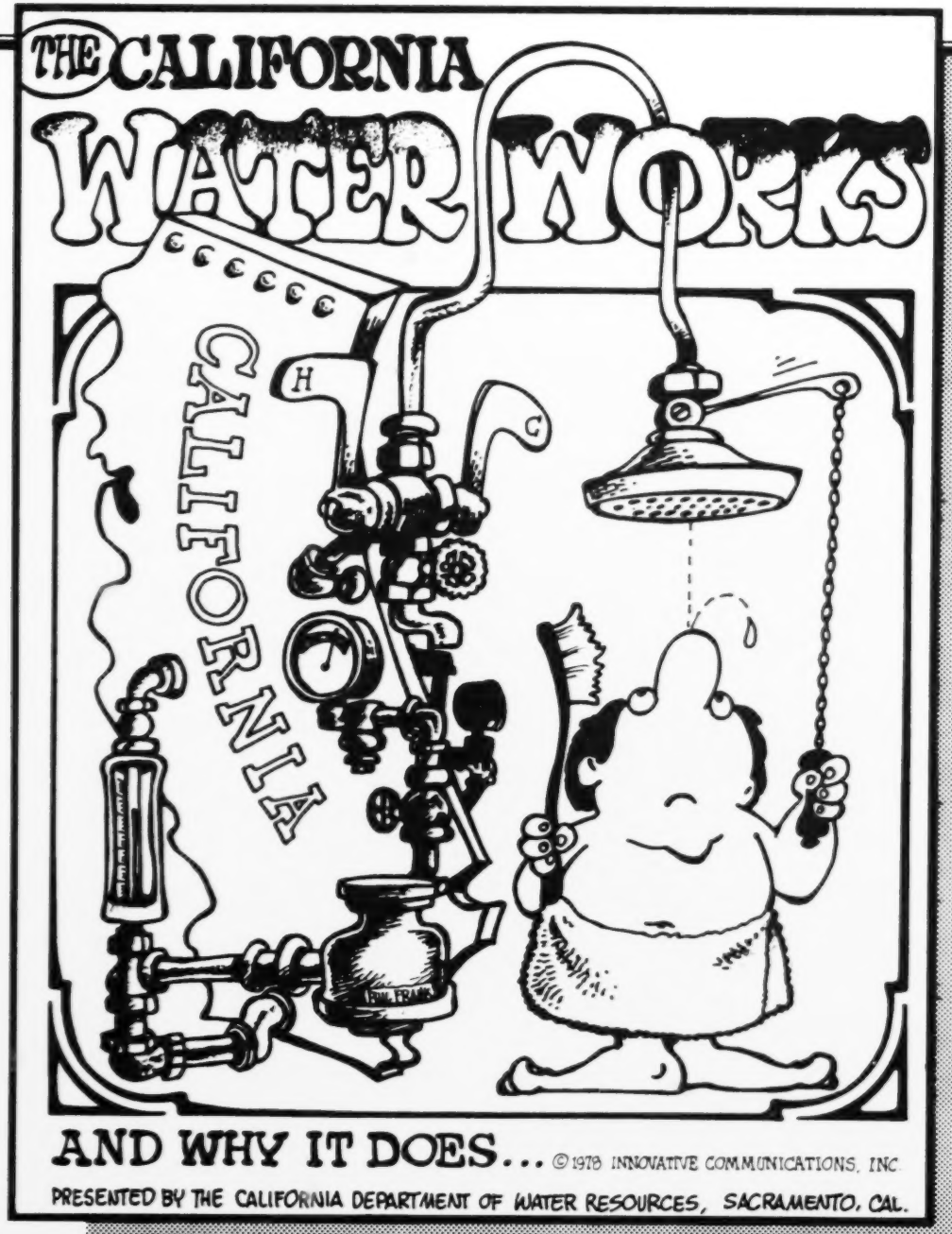
Student Workbook

ESSON 4: HISTORY OF WATER SUPPLY

Vocabulary

Los Angeles Aqueduct

Teacher's Guide



This material developed by Innovative Communications, Inc., under contract with the California Department of Water Resources.

The California Water Works, And Why It Does . . .

Copyright 1978

Grade level: 3-8

Cost: One copy free. Classroom sets are provided after teacher training.

Available from:
Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001
(916) 322-3070

Description:

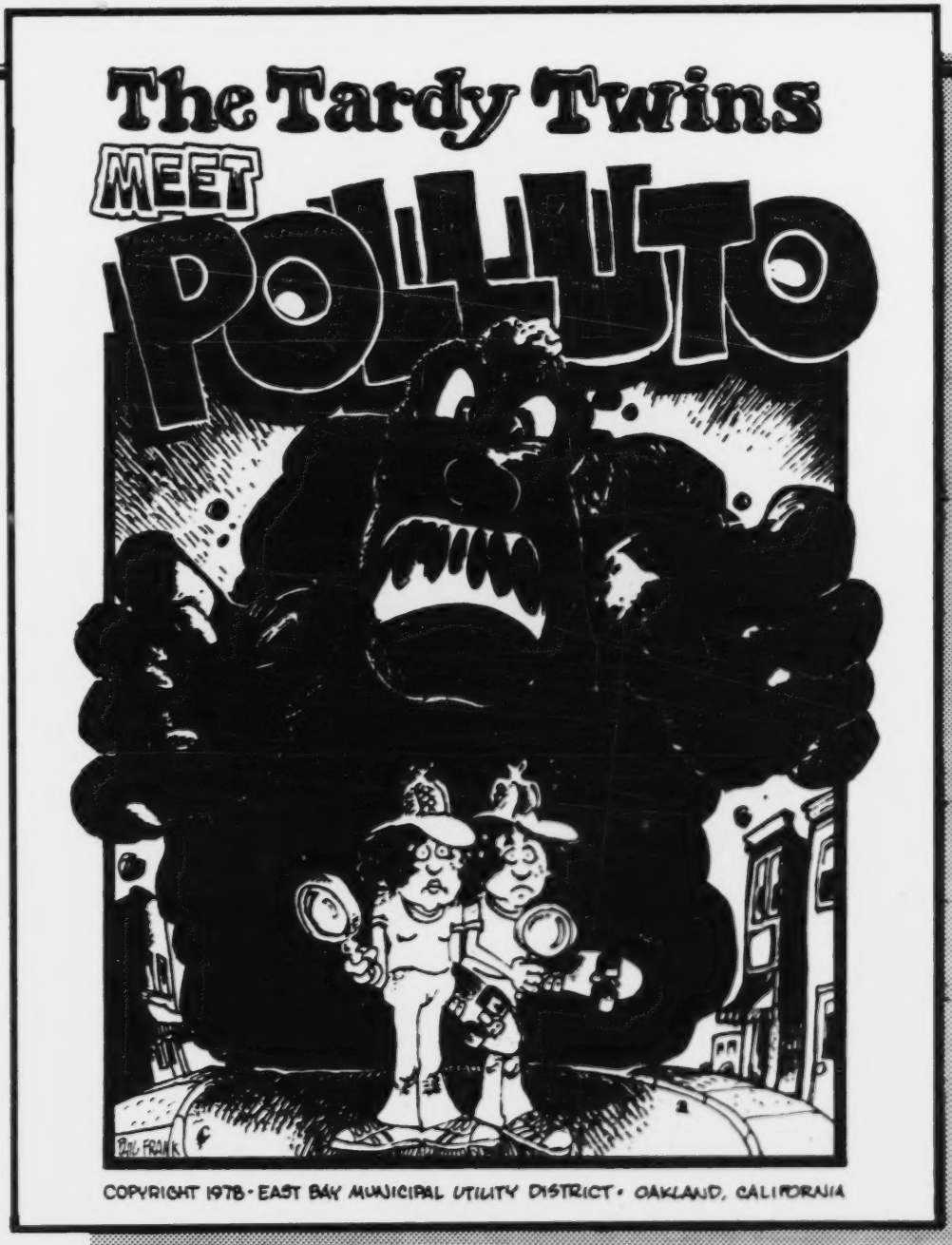
The California Water Works And Why It Does... follows Professor Goodwater through an overview of California's natural and built water systems, the water cycle, water use, and conservation. Also included are a coloring activity and a word search. The colorful illustrations and light narrative make this enjoyable for elementary students. The wealth of information provided is also useful for older students and adults.

This booklet could supplement a science, geography, or social science curriculum, or would be educational if just sent home with students. A Spanish language version, El Systema de Abastecimiento de Agua de California y Como Funciona..., is also available.

Now that our trusty biplane is high enough, we can see that California gets its rain and snow from those clouds coming from the ocean.
The clouds first come to the hills near the coast — this is where the first rain usually falls from a big storm.
PROF. GOODWATER
SALINAS RIVER
OUR NATURAL WATER SYSTEM

Booklet

Spanish-Language Booklet



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The Tardy Twins Meet Polluto

Copyright 1978

Grade level: 4-6

Cost: Free to teachers in the East Bay MUD service area. Others contact East Bay MUD for ordering information.

Available from:
East Bay Municipal Utility District
P. O. Box 24055
Oakland, CA 94623
(415) 891-0615

Description:

The Tardy Twins Meet Polluto acquaints upper elementary students with the operation and importance of wastewater treatment facilities. It expands the study of water conservation to include both social and scientific concepts.

In the student workbook, the Tardy Twins tour a sewage treatment plant and discover how polluted water is reduced to nearly pure water. The teacher's guide clearly explains water pollution and wastewater treatment. These materials would be especially useful in conjunction with a visit to a water treatment facility.

UNCLE SMEDLEY!! QUICK! LOOK AT THE WATER POLLUTION WE DISCOVERED IN THE RIVER!!
HMM.. YES, SO I SEE.
TRUE, WHAT YOU'VE FOUND IS POLLUTION. HOWEVER, IT'S NATURE'S POLLUTION!.. A PART OF OUR ENVIRONMENT (SURROUNDINGS).
..AND NATURE HAS ITS OWN SYSTEM OF WATER PURIFICATION (CLEANING) TO CONTROL ITS OWN POLLUTION AND PROTECT THE ENVIRONMENT. IMPURITIES (DIRT) SUCH AS SALT ARE EVEN PHYSICALLY REMOVED BY EVAPORATION OF WATER.
AS A RIVER FLOWS, IT PICKS UP 'NATURE'S GARBAGE'. LEAVES BRANCHES, ANIMAL BONES, SILT (MUD).. THIS GARBAGE IS EITHER ORGANIC OR INORGANIC. ORGANIC MEANS IT WAS ONCE PART OF A LIVING PLANT OR ANIMAL. INORGANIC MATTER IS MADE UP OF NONLIVING SUBSTANCES LIKE MINERALS AND SALTS.
POLLUTANTS ARE REMOVED BY FLOATING TO BANKS OR SETTLING TO THE BOTTOMS OF STREAMS. THE ORGANIC SUBSTANCES SUSPENDED (HELD) IN THE WATER DECOMPOSE (DECAY). MICRO-ORGANISMS (VERY SMALL LIVING THINGS) INCLUDING HELPFUL BACTERIA USE OXYGEN FROM THE AIR TO OXIDIZE OR TURN THE ORGANIC MATERIAL INTO A FORM WHICH MAY SETTLE OUT OF THE WATER.
2.

Student Workbook

AN INITIATING ACTIVITY

...mpress upon the students the significance of the problem of water pollution and the ...its control, the following experiment is suggested to introduce the study.

...lass into small groups of 3-5 students. Provide them with:

...3 filled with clean water
...rt jar
...and very small rocks
...or mud, including decaying organic material
...salt
...ns vegetable oil

...uss with the students, and have them list on the board, the variety of components ...tributed by homes, stores and factories into our wastewater. Note that in addition to ...es, sewage is composed of thousands of kinds of organic and inorganic impurities.

...n the representative sample of pollution ingredients that they have before them ...udents "produce" wastewater by adding the substances to the 2/3 filled quart jar ...ake the jar 10 times.

...ave successfully polluted the water, suggest that they "control" the pollution that ...st created. For this task, supply each group with:

...ainers of various sizes
...ece of wire screen
...
...ls

...have completed their pollution control experiment, discuss their "success." Is the ...clean? What impurities might still remain? How could they test it to find out? What ...ment and/or procedures might be necessary or helpful in purifying the water to a ...ee? How does this compare with the task of cleaning up millions of gallons of ...produced in our cities every day?

...Tardy Twins Meet Polluto" explains to elementary students the complicated process of municipal water pollution control. The following section of this teacher's guide covers the same material as the student booklet but with more background information.

3

Teacher's Guide

A Water Conservation Program from Metropolitan Water District of Southern California

WATER FOR URSA

Name _____

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Water for Ursa

Copyright 1983

Grade level: 6

Cost: Kit free to teachers in MWD service area only. Teacher in-service training is required (consumables resupplied yearly).

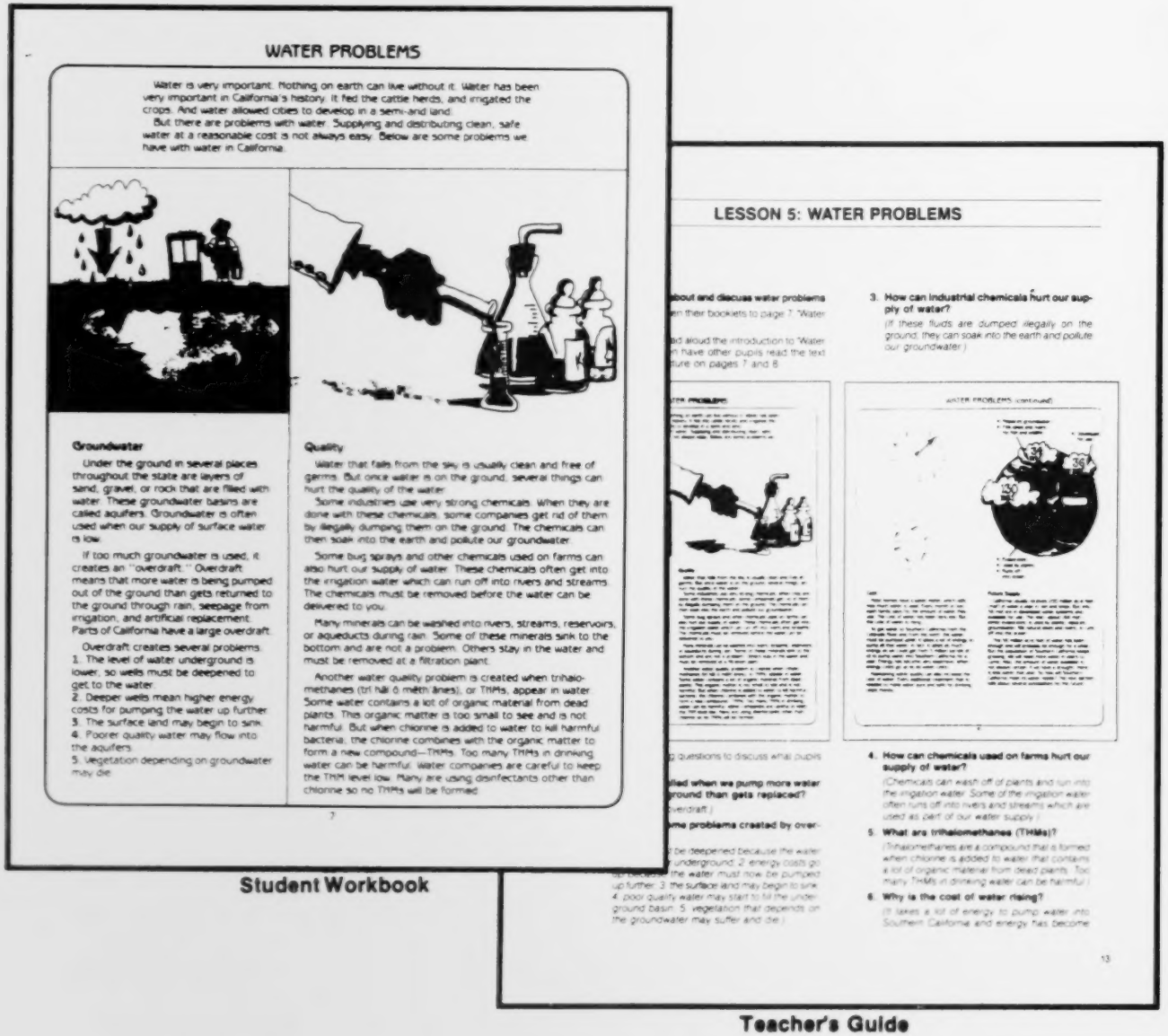
Available from:

Education Coordinator
The Metropolitan Water District
of Southern California
Public Information Division
1111 Sunset Boulevard
Los Angeles, CA 90054
(213) 250-6739

Description:

Water for Ursa is a Water Education Program for 6th graders in MWD's service area, and is a partner to Admiral Splash for the 4th grade. (Kit contains the same type components as Admiral Splash.) This program is designed for ten lessons, with exercises taking about 30 to 45 minutes each.

Representatives from the planet Ursa want guidance on how to provide enough water to all of Ursa's inhabitants. Southern California's climate and demographic profile are similar to Ursa's and may serve as a good model. Water for Ursa not only discusses history and information about Southern California's water system, but also identifies water management problems, discusses future water sources, and outlines water conservation techniques. This curriculum is an exciting application of water concepts.



WATER PROBLEMS

Water is very important. Nothing on earth can live without it. Water has been very important in California's history. It fed the cattle herds, and irrigated the crops. And water allowed cities to develop in a semi-arid land.

But there are problems with water. Supplying and distributing clean, safe water at a reasonable cost is not always easy. Below are some problems we have with water in California.

Groundwater

Under the ground in several places throughout the state are layers of sand, gravel, or rock that are filled with water. These groundwater basins are called aquifers. Groundwater is often used when our supply of surface water is low.

If too much groundwater is used, it creates an "overdraft." Overdraft means that more water is being pumped out of the ground than gets returned to the ground through rain, seepage from irrigation, and artificial replacement. Parts of California have a large overdraft.

Overdraft creates several problems.
1. The level of water underground is lower, so wells must be deepened to get to the water.
2. Deeper wells mean higher energy costs for pumping the water up further.
3. The surface land may begin to sink.
4. Poorer quality water may flow into the aquifers.
5. Vegetation depending on groundwater may die.

Quality

Water that falls from the sky is usually clean and free of germs. But once water is on the ground, several things can hurt the quality of the water.

Some industries use very strong chemicals. When they are done with these chemicals, some companies get rid of them by illegally dumping them on the ground. The chemicals can then soak into the earth and pollute our groundwater.

Some bug sprays and other chemicals used on farms can also hurt our supply of water. These chemicals often get into the irrigation water which can run off into rivers and streams. The chemicals must be removed before the water can be delivered to you.

Many minerals can be washed into rivers, streams, reservoirs, or aqueducts during rain. Some of these minerals sink to the bottom and are not a problem. Others stay in the water and must be removed at a filtration plant.

Another water quality problem is created when trihalomethanes (tri hăl ō meth ānes), or THMs, appear in water. Some water contains a lot of organic material from dead plants. This organic matter is too small to see and is not harmful. But when chlorine is added to water to kill harmful bacteria, the chlorine combines with the organic matter to form a new compound—THMs. Too many THMs in drinking water can be harmful. Water companies are careful to keep the THM level low. Many are using disinfectants other than chlorine so no THMs will be formed.

7

Student Workbook

LESSON 5: WATER PROBLEMS

...about and discuss water problems
...in their booklets to page 7 "Water
...ad aloud the introduction to "Water
...n have other pupils read the text
...ture on pages 7 and 8.

3. **How can industrial chemicals hurt our supply of water?**
(If these fluids are dumped illegally on the ground, they can soak into the earth and pollute our groundwater.)

...g questions to discuss what pupils
...lled when we pump more water
...ground than gets replaced?
...overdraft.)
...me problems created by over-
...be deepened because the water
...underground. 2. energy costs go
...the water must now be pumped
up further. 3. the surface land may begin to sink.
4. (poor quality water may start to fill the underground basin. 5. vegetation that depends on the groundwater may suffer and die.)

4. **How can chemicals used on farms hurt our supply of water?**
(Chemicals can wash off of plants and run into the irrigation water. Some of the irrigation water often runs off into rivers and streams which are used as part of our water supply.)

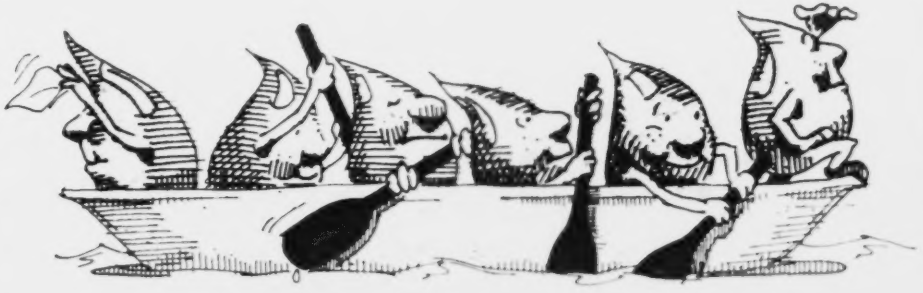
5. **What are trihalomethanes (THMs)?**
(Trihalomethanes are a compound that is formed when chlorine is added to water that contains a lot of organic material from dead plants. Too many THMs in drinking water can be harmful.)

6. **Why is the cost of water rising?**
(It takes a lot of energy to pump water into Southern California and energy has become

13

Teacher's Guide

A Journey Down the Colorado River Aqueduct



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A Journey Down the Colorado River Aqueduct

Revised 1984

Grade level: 3-9

Cost: Free to teachers in MWD service area. One free sample brochure to others.

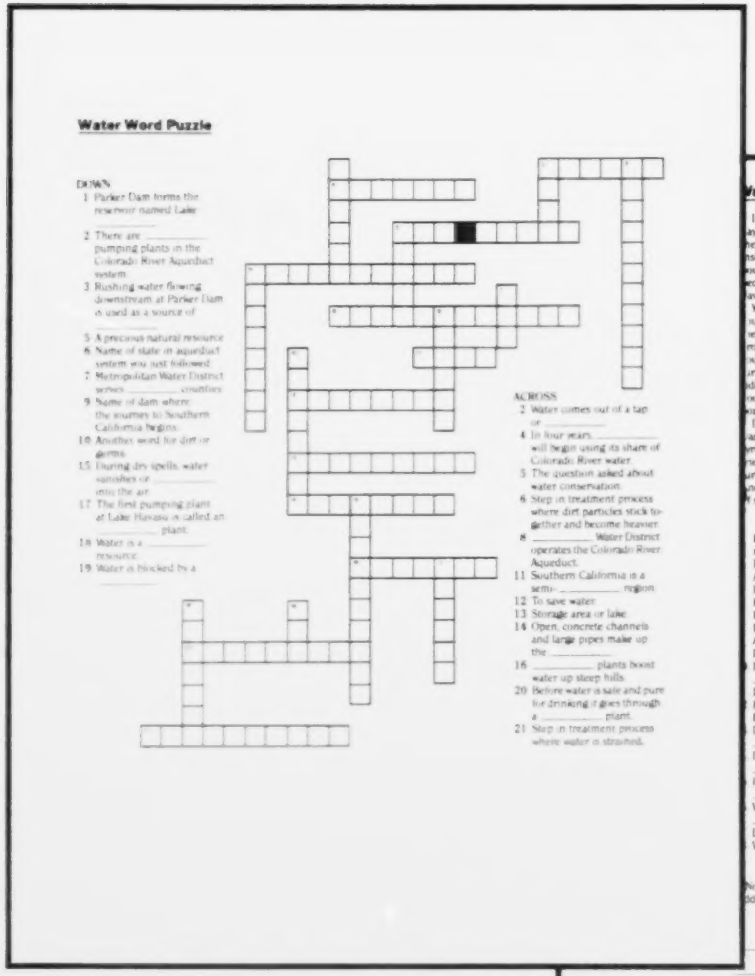
Available from:

Education Coordinator
The Metropolitan Water District
of Southern California
Public Information Division
1111 Sunset Boulevard
Los Angeles, CA 90054
(213) 250-6739

Description:

The cover of this bright yellow brochure shows a group of energetic water drops rowing a boat. These little drops set the tone for an upbeat "journey" through the system that supplies water to The Metropolitan Water District of Southern California's customers. A Journey Down the Colorado River Aqueduct tells the students where their water comes from and why it is a resource we should use with care.

The center fold-out has an animated map of the region including lakes, aqueducts, pumping and water treatment facilities, and a description of the water treatment process. Also included are a Water Word Puzzle and an imaginative home water-use exercise.

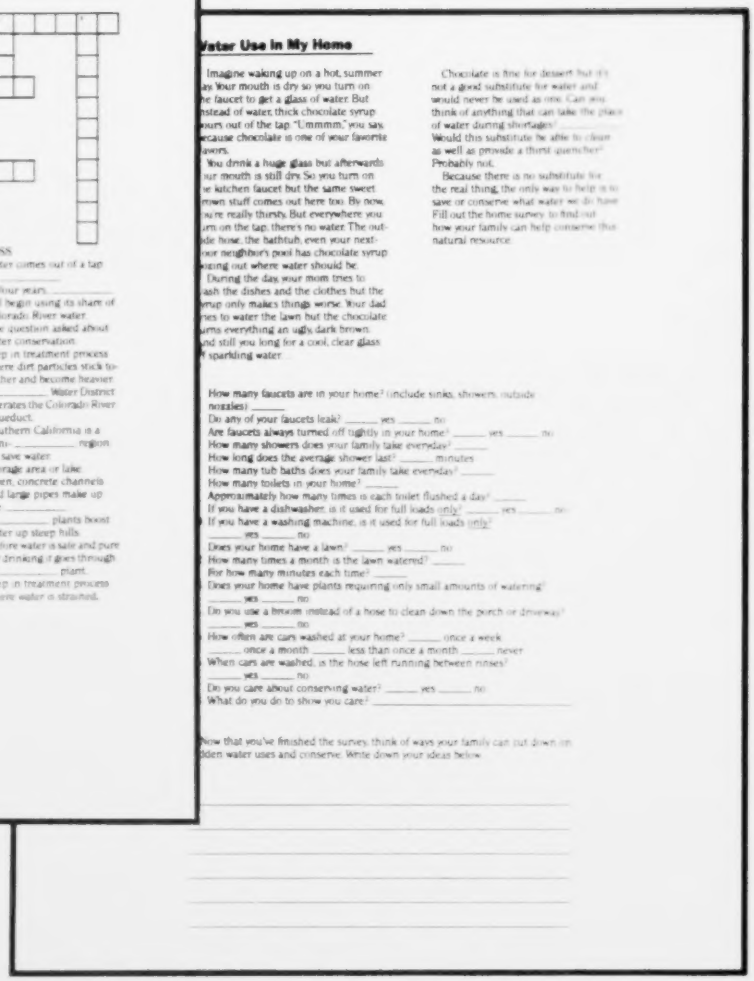


Water Word Puzzle

DOWN
1 Parker Dam forms the reservoir named Lake _____.
2 There are _____ pumping plants in the Colorado River Aqueduct system.
3 Rushing water flowing downstream at Parker Dam is used as a source of _____.
5 A precious natural resource
6 Name of state in aqueduct system you just followed
7 Metropolitan Water District serves _____ counties.
9 Name of dam where the journey to Southern California begins.
10 Another word for dirt or germs.
15 During dry spells, water vanishes or _____ into the air.
17 The first pumping plant at Lake Havasu is called an _____ plant.
18 Water is a _____ resource.
19 Water is blocked by a _____.

ACROSS
2 Water comes out of a tap or _____.
4 In four years, _____ will begin using its share of Colorado River water.
5 The question asked about water conservation.
6 Step in treatment process where dirt particles stick together and become heavier.
8 _____ Water District operates the Colorado River Aqueduct.
11 Southern California is a semi-_____ region.
12 To save water.
13 Storage area or lake.
14 Open, concrete channels and large pipes make up the _____.
16 _____ plants boost water up steep hills.
20 Before water is safe and pure for drinking it goes through a _____ plant.
21 Step in treatment process where water is strained.

Brochure



Water Use In My Home

Imagine waking up on a hot, summer day. Your mouth is dry so you turn on the faucet to get a glass of water. But instead of water, thick chocolate syrup pours out of the tap. "Ummmm," you say, because chocolate is one of your favorite flavors.

You drink a huge glass but afterwards your mouth is still dry. So you turn on the kitchen faucet but the same sweet brown stuff comes out here too. By now, you're really thirsty. But everywhere you turn on the tap, there's no water. The outside hose, the bathtub, even your next-door neighbor's pool has chocolate syrup oozing out where water should be.

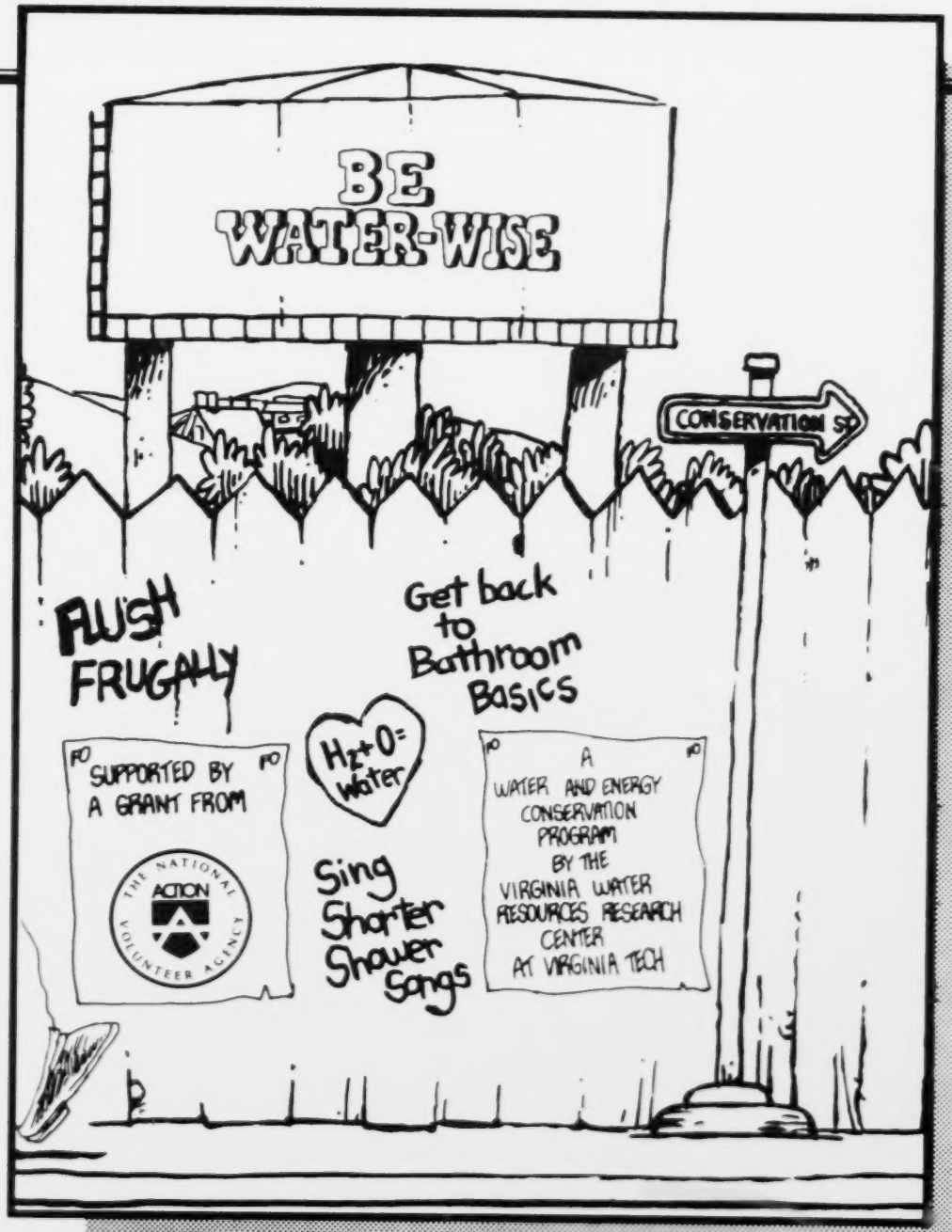
During the day, your mom tries to wash the dishes and the clothes but the syrup only makes things worse. Your dad tries to water the lawn but the chocolate turns everything an ugly, dark brown. And still you long for a cool, clear glass of sparkling water.

Chocolate is fine for dessert but it's not a good substitute for water and would never be used as one. Can you think of anything that can take the place of water during shortages? Would this substitute be able to clean as well as provide a thirst quencher? Probably not.

Because there is no substitute for the real thing, the only way to help is to save or conserve what water we do have. Fill out the home survey to find out how your family can help conserve this natural resource.

How many faucets are in your home? (include sinks, showers, outside nozzles) _____
Do any of your faucets leak? _____ yes _____ no
Are faucets always turned off tightly in your home? _____ yes _____ no
How many showers does your family take everyday? _____
How long does the average shower last? _____ minutes
How many tub baths does your family take everyday? _____
How many toilets in your home? _____
Approximately how many times is each toilet flushed a day? _____
If you have a dishwasher, is it used for full loads only? _____ yes _____ no
If you have a washing machine, is it used for full loads only? _____ yes _____ no
Does your home have a lawn? _____ yes _____ no
How many times a month is the lawn watered? _____
For how many minutes each time? _____
Does your home have plants requiring only small amounts of watering? _____ yes _____ no
Do you use a broom instead of a hose to clean down the porch or driveway? _____ yes _____ no
How often are cars washed at your home? _____ once a week _____ once a month _____ less than once a month _____ never
When cars are washed, is the hose left running between rinses? _____ yes _____ no
Do you care about conserving water? _____ yes _____ no
What do you do to show you care? _____

Now that you've finished the survey, think of ways your family can cut down on hidden water uses and conserve. Write down your ideas below.



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Be Water-Wise

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Grade level: Flexible (target 7th)

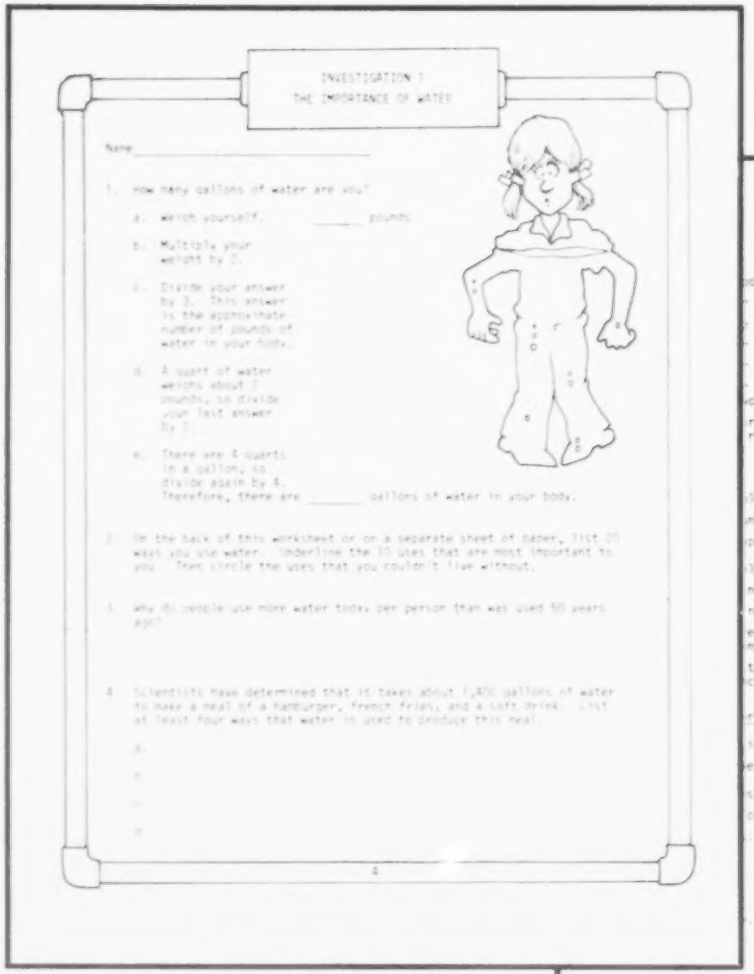
Cost: Student Workbook $1.25
Teacher's Guide $3.00

Available from:
Virginia Water Resources
Research Center
Virginia Polytechnic Institute
and State University
617 North Main Street
Blacksburg, VA 24060
(703) 961-5624

Description:

Be Water-Wise is a water education unit that is designed to help students recognize the critical role of water in their lives, to help them understand why water should be used wisely, and to encourage conservation. The lessons, simple experiments, and background information provided are clearly effective.

The student booklet is written in a conversational style and uses subtopics and graphics to enhance students' understanding. There are six main lessons including "The Importance of Water," "Getting Water To and From Our Homes," and "Water Conservation In Our Homes." For each lesson, the teacher's guide outlines major concepts, lesson objectives, teaching suggestions, and additional activities. Ditto masters can easily be made from the investigation sheets that correspond to each lesson. Related test questions are provided.


INVESTIGATION 1
THE IMPORTANCE OF WATER

Name_____

1. How many gallons of water are you?

a. Weigh yourself. _____ pounds

b. Multiply your weight by 2.

c. Divide your answer by 3. This answer is the approximate number of pounds of water in your body.

d. A quart of water weighs about 2 pounds, so divide your last answer by 2.

e. There are 4 quarts in a gallon, so divide again by 4. Therefore, there are _____ gallons of water in your body.

2. On the back of this worksheet or on a separate sheet of paper, list 20 ways you use water. Underline the 10 uses that are most important to you. Then circle the uses that you couldn't live without.

3. Why do people use more water today per person than was used 50 years ago?

4. Scientists have determined that it takes about 1,400 gallons of water to make a meal of a hamburger, french fries, and a soft drink. List at least four ways that water is used to produce this meal.

a.

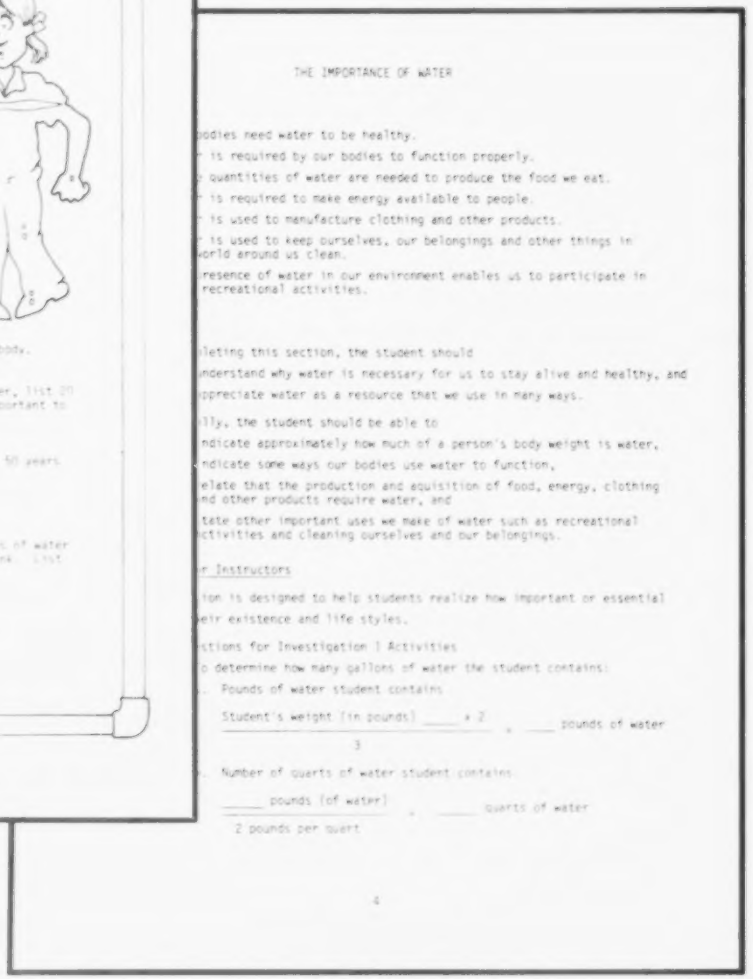
b.

c.

d.

4

Student Workbook


THE IMPORTANCE OF WATER

odies need water to be healthy.
r is required by our bodies to function properly.
quantities of water are needed to produce the food we eat.
r is required to make energy available to people.
r is used to manufacture clothing and other products.
r is used to keep ourselves, our belongings and other things in
orld around us clean.
resence of water in our environment enables us to participate in
recreational activities.

leting this section, the student should
nderstand why water is necessary for us to stay alive and healthy, and
ppreciate water as a resource that we use in many ways.

lly, the student should be able to
ndicate approximately how much of a person's body weight is water,
ndicate some ways our bodies use water to function,
elate that the production and equisition of food, energy, clothing
nd other products require water, and
tate other important uses we make of water such as recreational
ctivities and cleaning ourselves and our belongings.

r Instructors

ion is designed to help students realize how important or essential
eir existence and life styles.

stions for Investigation 1 Activities
o determine how many gallons of water the student contains:
. Pounds of water student contains

Student's weight (in pounds) ____ x 2 / 3 = ____ pounds of water

. Number of quarts of water student contains

_____ pounds (of water) / 2 pounds per quart = _____ quarts of water

4

Teacher's Guide

THE OFFICIAL

CAPTAIN HYDRO

WATER CONSERVATION WORKBOOK

PRESENTED BY: CALIFORNIA DEPARTMENT OF WATER RESOURCES, CALIFORNIA DEPARTMENT OF EDUCATION AND YOUR LOCAL WATER SUPPLIER.

Permission to use this material granted by East Bay Municipal Utility District.

The Official Captain Hydro Water Conservation Workbook

Copyright 1975, Revised 1982.

Grade level: 5-8

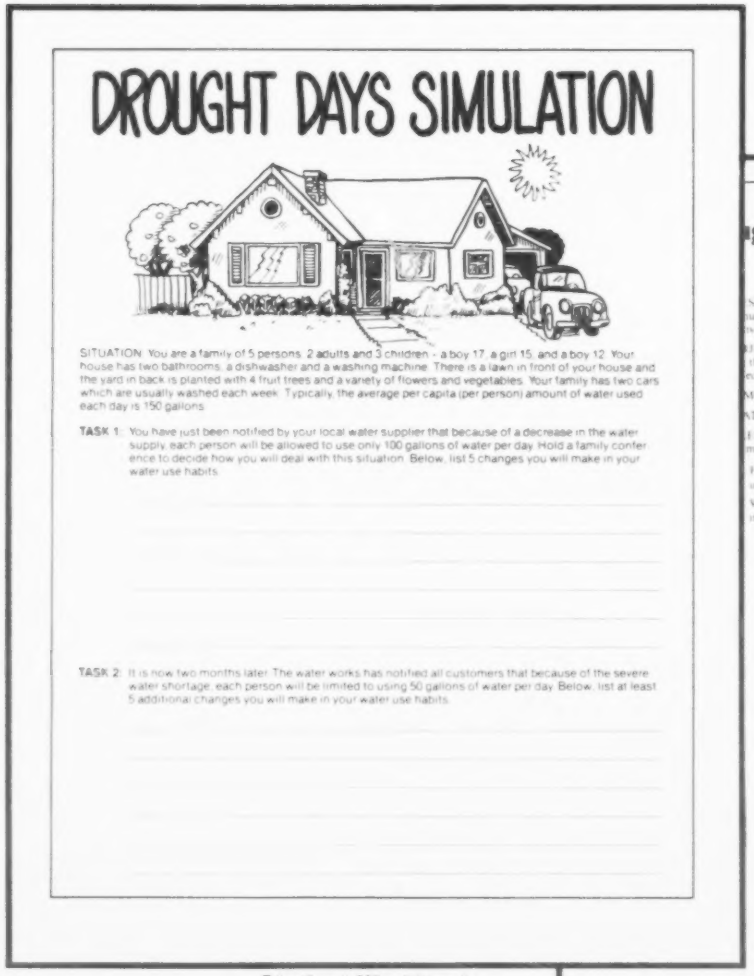
Cost: Free to teachers in East Bay MUD service area. Others contact the Department of Water Resources for ordering information.

Available from:
East Bay Municipal Utility District
P. O. Box 24055
Oakland, CA 94623
(415) 891-0615

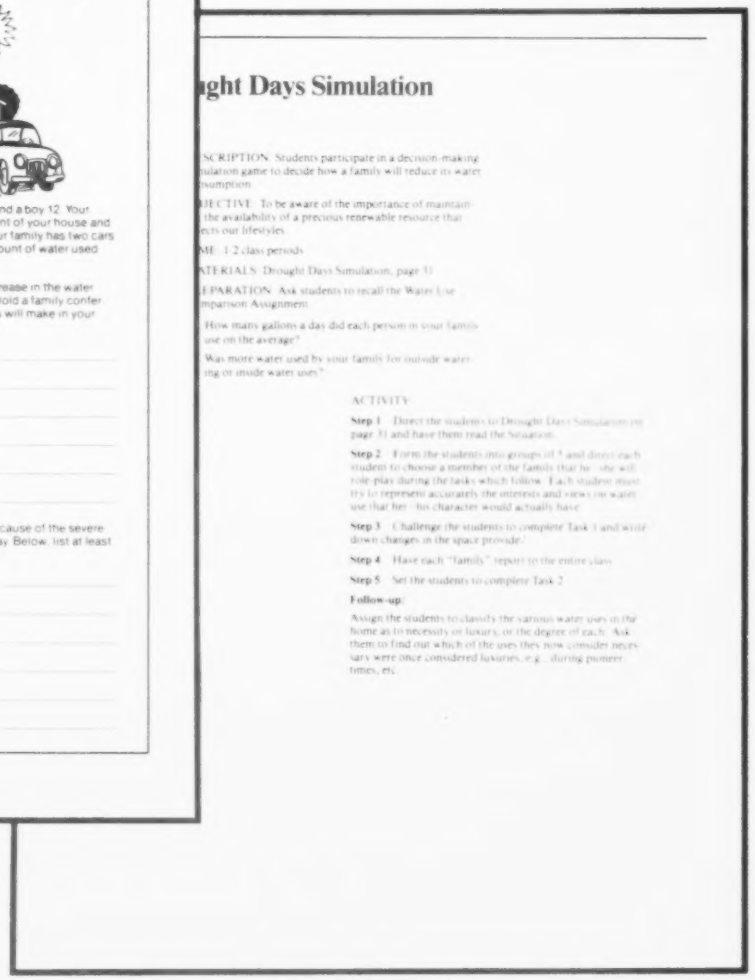
Description:

Using an interdisciplinary approach, Captain Hydro incorporates goals and objectives stated in the 1981-84 Course of Study. Water concepts related to science and social science are presented for a target audience of sixth grade. The workbook covers three areas: "The Water Cycle: Natural and Built"; "Uses of Water"; and "Water Conservation and Management."

The lessons emphasize problem solving, decision making, and attitude formation rather than strict science or math exercises. For each lesson the teacher's guide provides a description, objectives, time and materials needed, and background information along with a step-by-step activity and follow-up for each lesson. An annotated bibliography of non-fiction water books is included at the end of the guide. A Spanish-language version, Capitan Tlaloc, is also available.


DROUGHT DAYS SIMULATION
SITUATION: You are a family of 5 persons, 2 adults and 3 children - a boy 17, a girl 15, and a boy 12. Your house has two bathrooms, a dishwasher and a washing machine. There is a lawn in front of your house and the yard in back is planted with 4 fruit trees and a variety of flowers and vegetables. Your family has two cars which are usually washed each week. Typically, the average per capita (per person) amount of water used each day is 150 gallons.
TASK 1: You have just been notified by your local water supplier that because of a decrease in the water supply, each person will be allowed to use only 100 gallons of water per day. Hold a family conference to decide how you will deal with this situation. Below, list 5 changes you will make in your water use habits.
TASK 2: It is now two months later. The water works has notified all customers that because of the severe water shortage, each person will be limited to using 50 gallons of water per day. Below, list at least 5 additional changes you will make in your water use habits.

Student Workbook


ght Days Simulation
SCRIPTION: Students participate in a decision-making
ulation game to decide how a family will reduce its water
sumption.
JECTIVE: To be aware of the importance of maintain
the availability of a precious renewable resource that
cts our lifestyles.
ME: 1-2 class periods
ATERIALS: Drought Days Simulation, page 31
EPARATION: Ask students to recall the Water Use
mparison Assignment:
How many gallons a day did each person in your family
use on the average?
Was more water used by your family for outside water-
ing or inside water uses?
ACTIVITY
Step 1: Direct the students to Drought Days Simulation on
page 31 and have them read the Situation.
Step 2: Form the students into groups of 5 and direct each
student to choose a member of the family that he/she will
role-play during the tasks which follow. Each student must
try to represent accurately the interests and views on water
use that her/his character would actually have.
Step 3: Challenge the students to complete Task 1 and write
down changes in the space provided.
Step 4: Have each "family" report to the entire class.
Step 5: Set the students to complete Task 2.
Follow-up:
Assign the students to classify the various water uses in the
home as to necessity or luxury, or the degree of each. Ask
them to find out which of the uses they now consider neces-
sary were once considered luxuries, e.g., during pioneer
times, etc.

Teacher's Guide

Permission to use this material granted by Los Angeles Department of Water and Power.

Water Lifelines for Los Angeles

Copyright 1983

Grade Level: 5-9

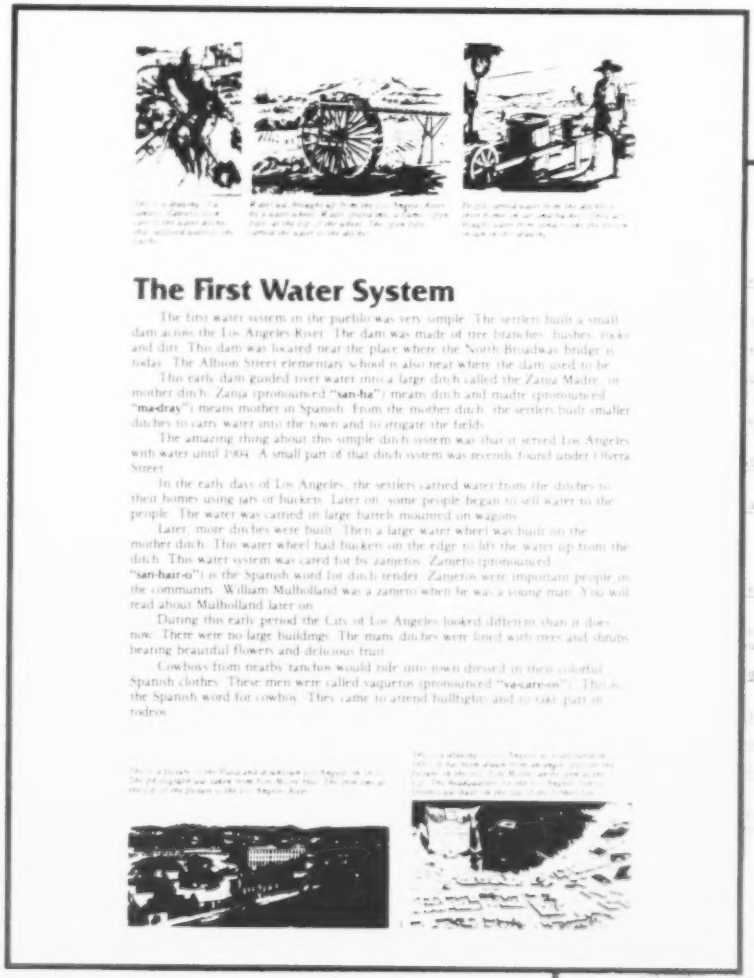
Cost: Free to teachers in the City of Los Angeles.

Available from:
Educational Services
Los Angeles Department of Water and Power
P. O. Box 111, Room 1509
Los Angeles, CA 90051
(213) 481-4169

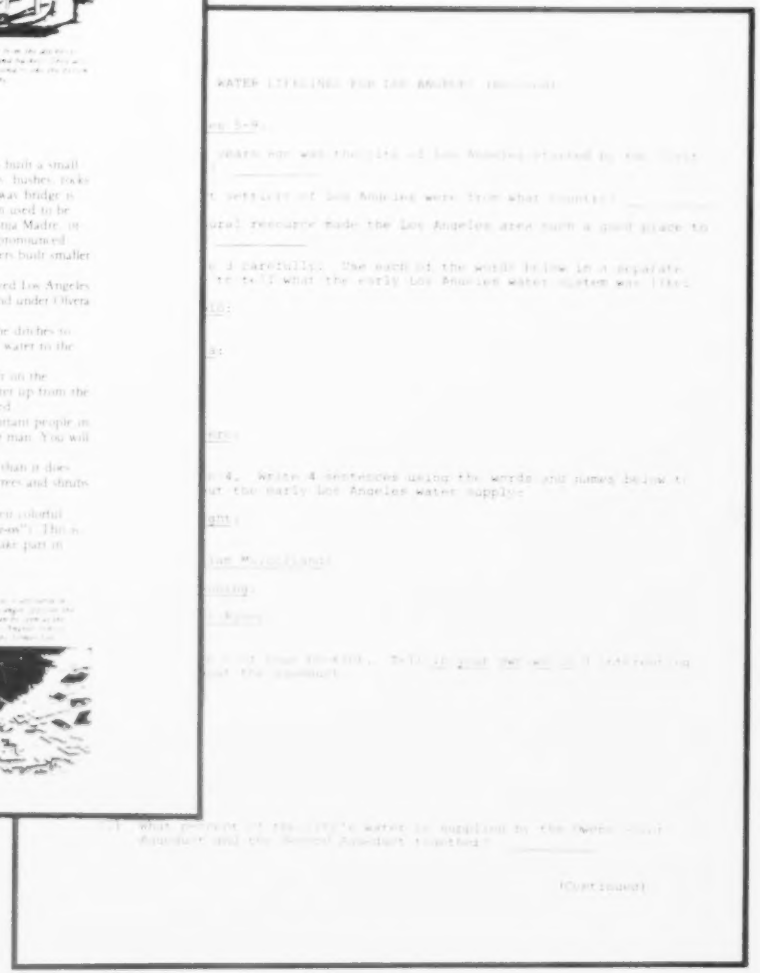
Description:

Water Lifelines for Los Angeles presents information on sources of Los Angeles' water, the water cycle, water quality, and the importance of conservation. The text is easy to read and understand, and there are many helpful illustrations. Discussion is especially detailed concerning the historical origins of the city water supply, which ties in well with history and social studies curricula.

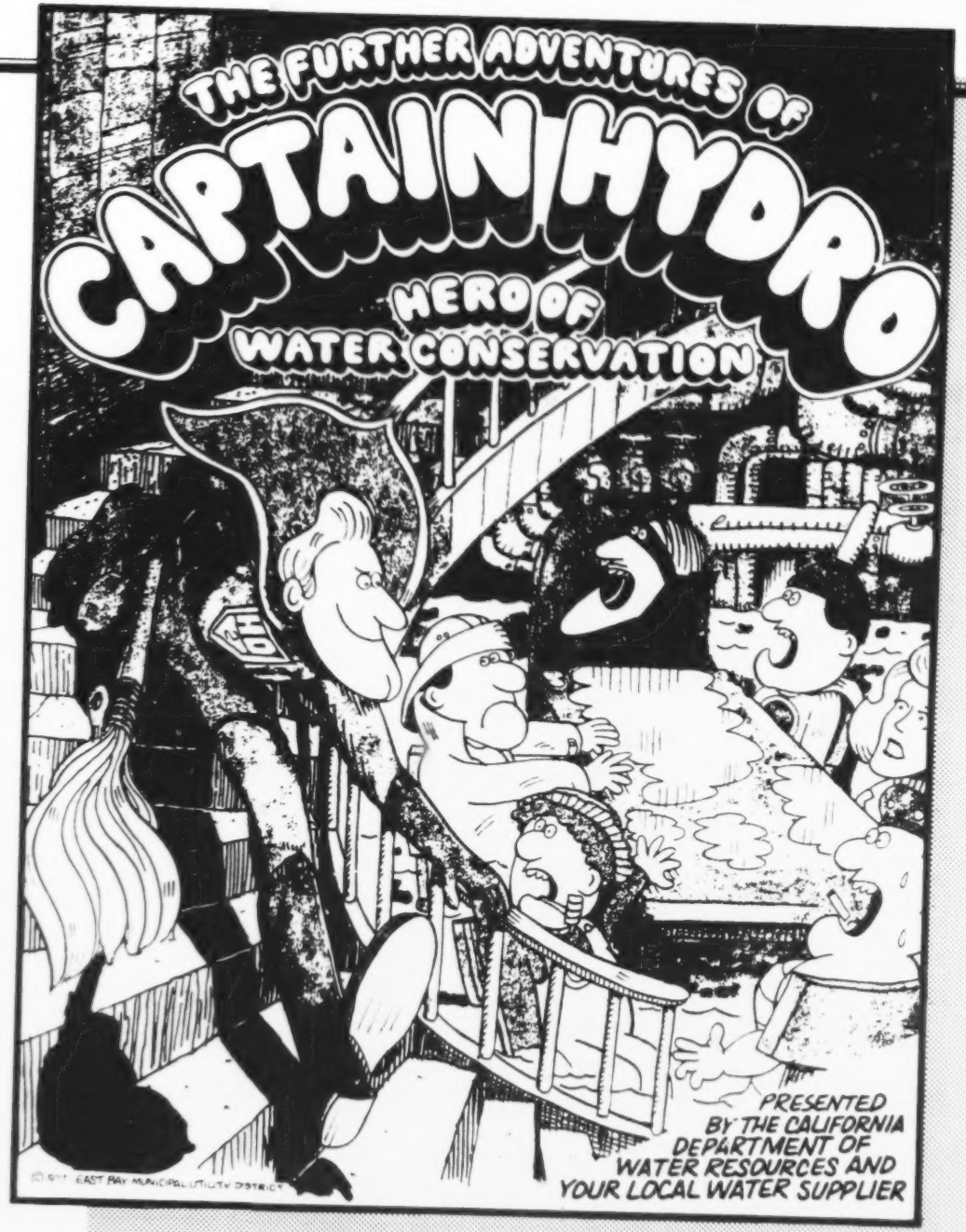
Also available is an open-book question sheet for use as a study aid or test. In addition, teachers in the city of Los Angeles can obtain films and speakers about water supply and conservation.



Booklet



Test



Permission to use this material granted by East Bay Municipal Utility District.

The Further Adventures of Captain Hydro

Copyright 1979

Grade level: 7-8

Cost: Free to teachers in the East Bay MUD service area. Others contact the Department of Water Resources for ordering information.

Available from:
East Bay Municipal Utility District
P. O. Box 24055
Oakland, CA 94623
(415) 891-0615

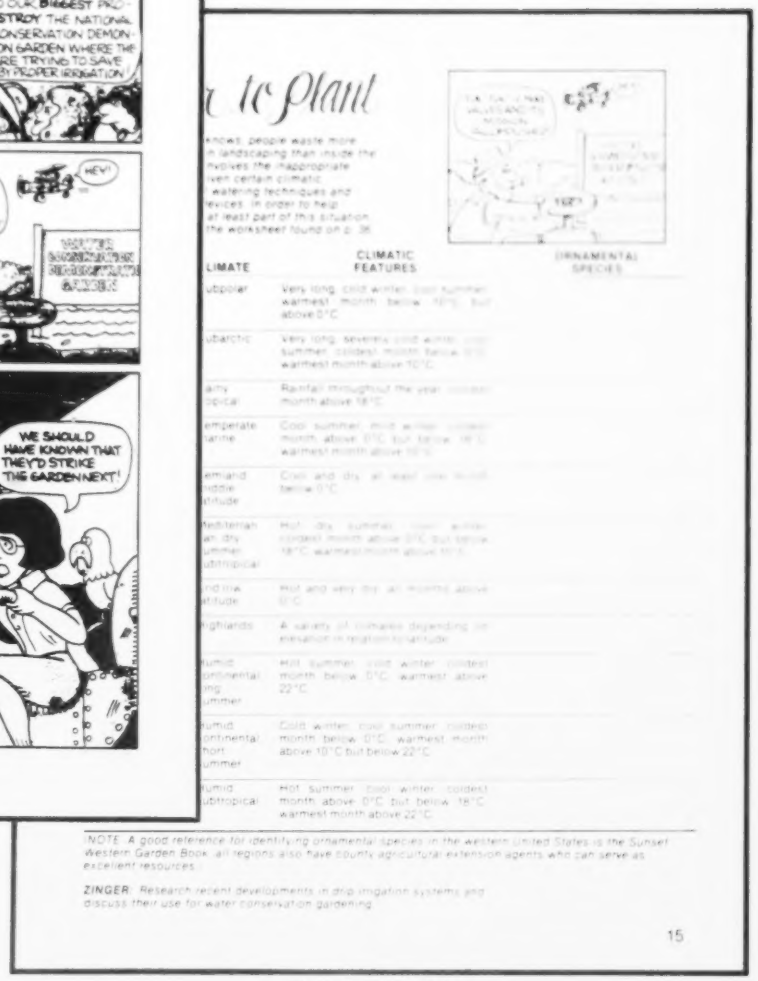
Description:

The Further Adventures of Captain Hydro incorporates educational concepts into an adventure comic book format. It bridges the gap between the The Official Captain Hydro Water Conservation Workbook and high school level materials by introducing water issues through problem-solving exercises.

Specifically, the teacher's guide has lessons designed for use in the areas of social science, mathematics, language arts, science, home economics, art, and music. Also included are "zingers" - suggestions for extension activities in each subject area. For further study, the teacher's guide describes additional resources, gives references, and has an extensive water bibliography.

ITS STRANGE BUT ITS WORKING!
I THINK WE SHOULD HAVE HITCHHIKED!
GOOD LUCK!
BACK AT THE WATER BANDITS HIDEOUT!
NOW THAT CAPTAIN HYDRO IS COMING NEXT TUESDAY WE CAN PLAN HIS SURPRISE BIG SPLASH! MEANWHILE WE HAVE TIME TO DO OUR BIGGEST PROJECT! WE'LL DESTROY THE NATIONAL WATER CONSERVATION DEMONSTRATION GARDEN WHERE THE FOOLS ARE TRYING TO SAVE WATER BY PROPER IRRIGATION!
OUR PLAN IS TO FLOOD THE ENTIRE AREA BY OPENING ALL THE VALVES AND SPRINKLERS! WELL USE UP ALL THE VALUABLE WATER AND MAKE THE WHOLE PROJECT AN ABSOLUTE FAILURE!!
GOOD! THE COUNTRYS MORALE WILL BE DOWN THE DRAIN!
AS WELL AS THE WATER SUPPLY! LET'S GO CHIEF!
YAK! YAK! I 2 MORE VALVES AND ITS MISSION ACCOMPLISHED!
HEY!
LEAPING LITRES!! THE BANDIT AND HIS CREW ARE AT IT AGAIN!!
WE SHOULD HAVE KNOWN THAT THEY'D STRIKE THE GARDEN NEXT!

Student Workbook


to Plant
CLIMATE
CLIMATIC FEATURES
ORNAMENTAL SPECIES
NOTE: A good reference for identifying ornamental species in the western United States is the Sunset Western Garden Book; all regions also have county agricultural extension agents who can serve as excellent resources.
ZINGER: Research recent developments in drip irrigation systems and discuss their use for water conservation gardening.
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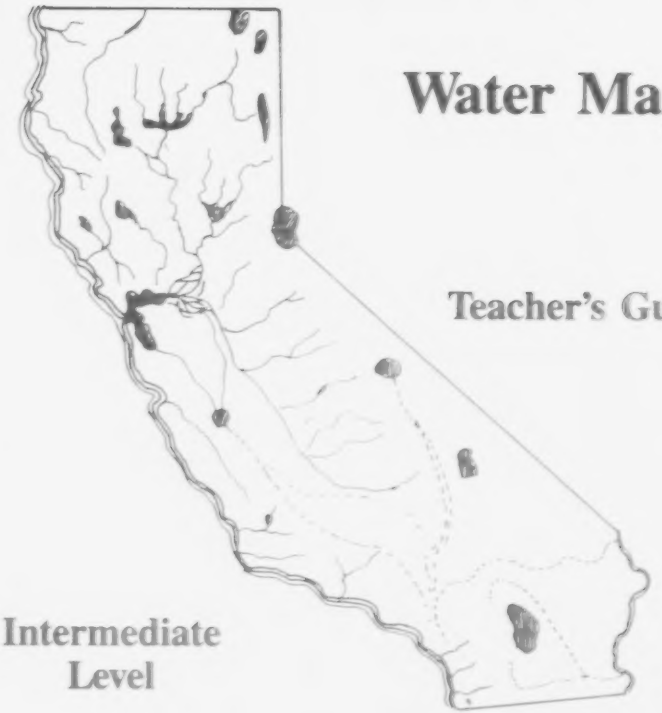
Teacher's Guide

WESTERN WATER



Water Map

Teacher's Guide

Intermediate Level

Published by Western Water Education Foundation

Permission to use this material granted by the Water Education Foundation (formerly Western Water Education Foundation).

The California Water Map Program

Copyright 1983

Grade level: 7-8

Cost: Complete Set $10.60

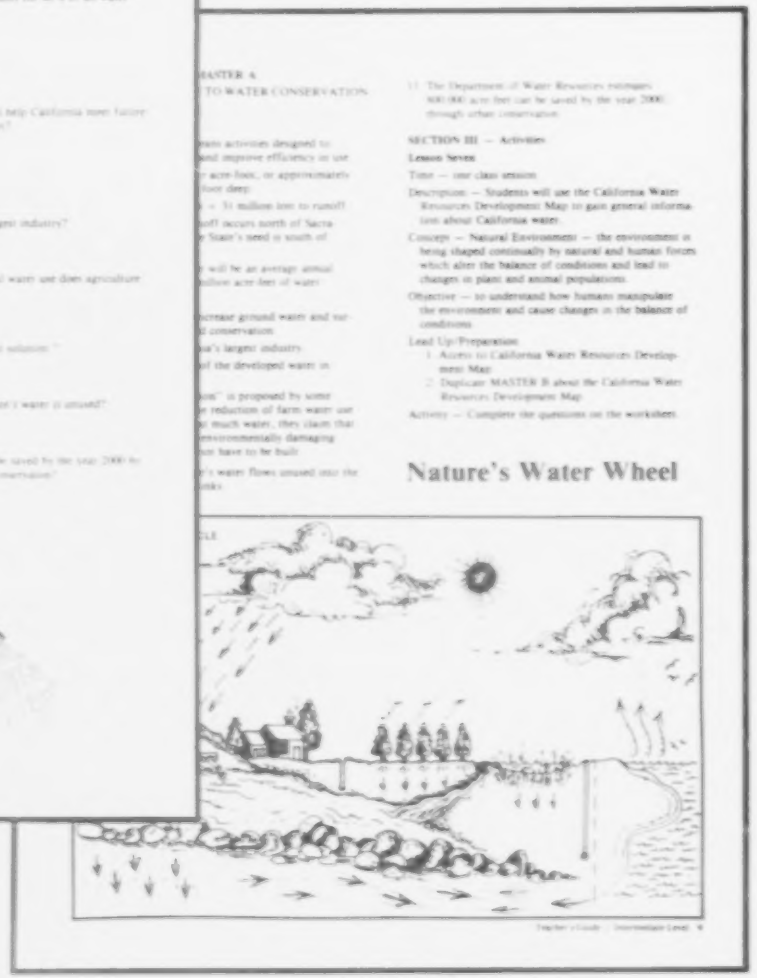
Available from:
Water Education Foundation
(formerly Western Water Education Foundation)
717 "K" Street, Suite 517
Sacramento, CA 95814
(916) 444-6240

Description:

The California Water Map Program helps students develop decision-making skills concerning water issues. The Water Map Set includes: the California Water Resources Development map; a teacher's guide; a Layperson's Guide to Water Conservation; 30 Western Water magazines; and 30 student workbooks. This unit is intended for intermediate grades (seventh and eighth).

The California Water Resources Development map and related activities explain the geographic and physical water pictures in California. The supportive materials provide background information necessary to complete the lessons and activities outlined in the teacher's guide.

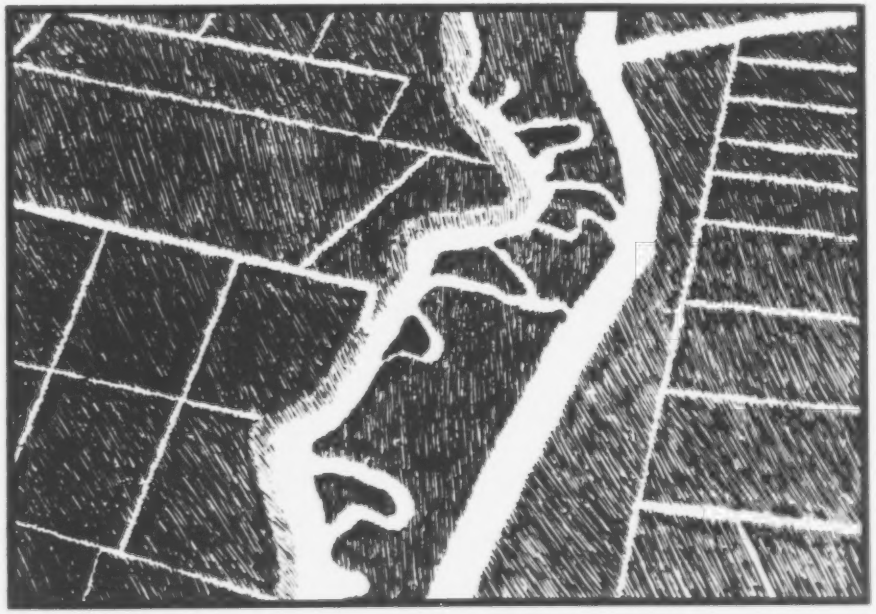
Student Workbook



Teacher's Guide

WESTERN WATER

The Delta Dilemma — Simulation Unit



Student's Guide

Published by Western Water Education Foundation

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The Delta Dilemma - Simulation Unit

Copyright 1983

Grade level: 9-12

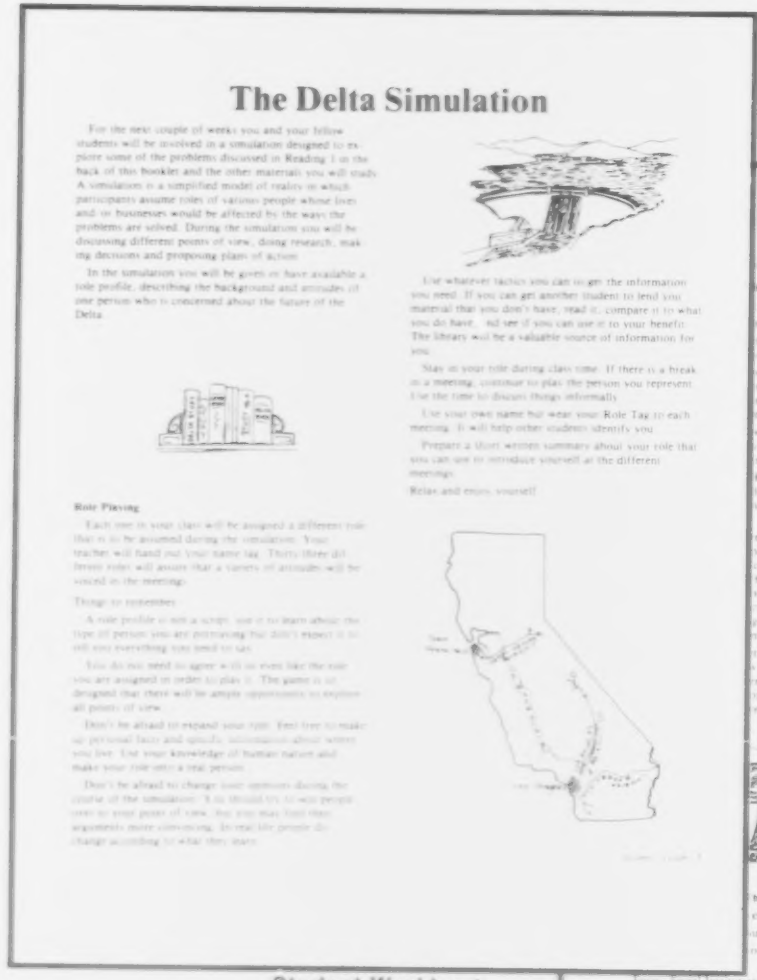
Cost: Complete Set $15.90

Available from:
Water Education Foundation
(formerly Western Water Education Foundation)
717 "K" Street, Suite 517
Sacramento, CA 95814
(916) 444-6240

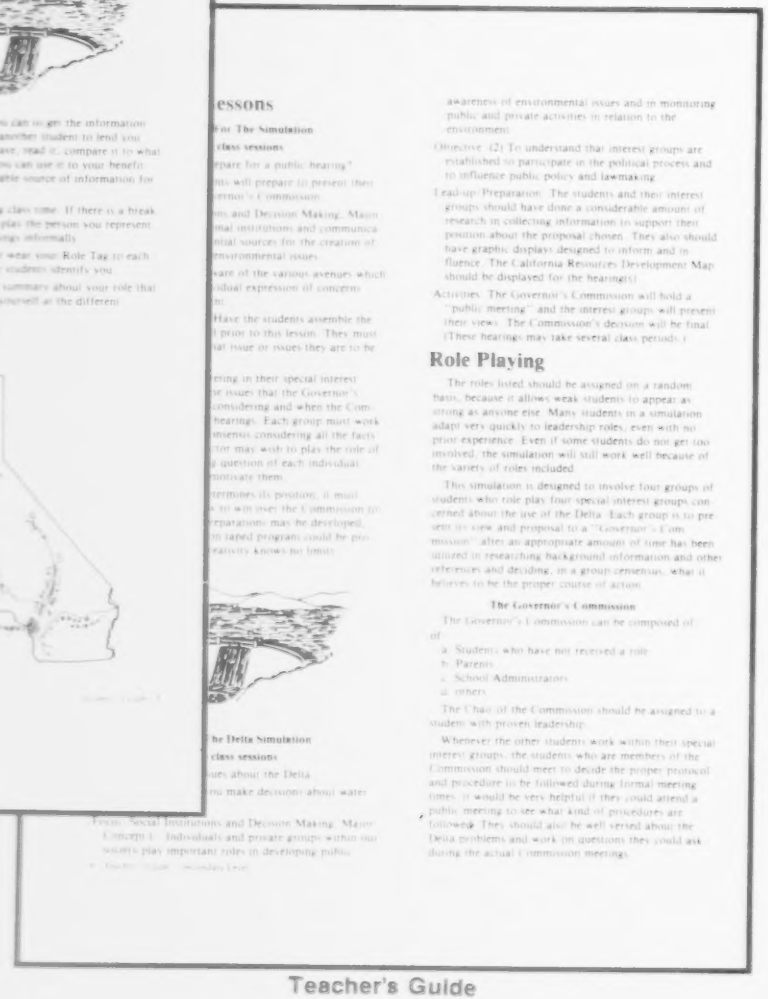
Description:

Forty percent of California's water converges in the Sacramento-San Joaquin Delta before it is transported to central and southern Californians. The Delta Dilemma - Simulation Unit helps students develop problem-solving and decision-making skills while familiarizing them with a crucial issue. The Delta set, intended for use at the high school level, includes: a Layperson's Guide to the Delta; a Layperson's Guide to Water Conservation; 30 copies of the Western Water magazine on the Delta; 30 student workbooks; and a teacher's guide.

The simulation is a research and role-play exercise that deals with the complex social and environmental problems and conflicting opinions involved in managing the Delta. This unit would be appropriate for social studies, geography, or science/environmental education classes.



Student Workbook

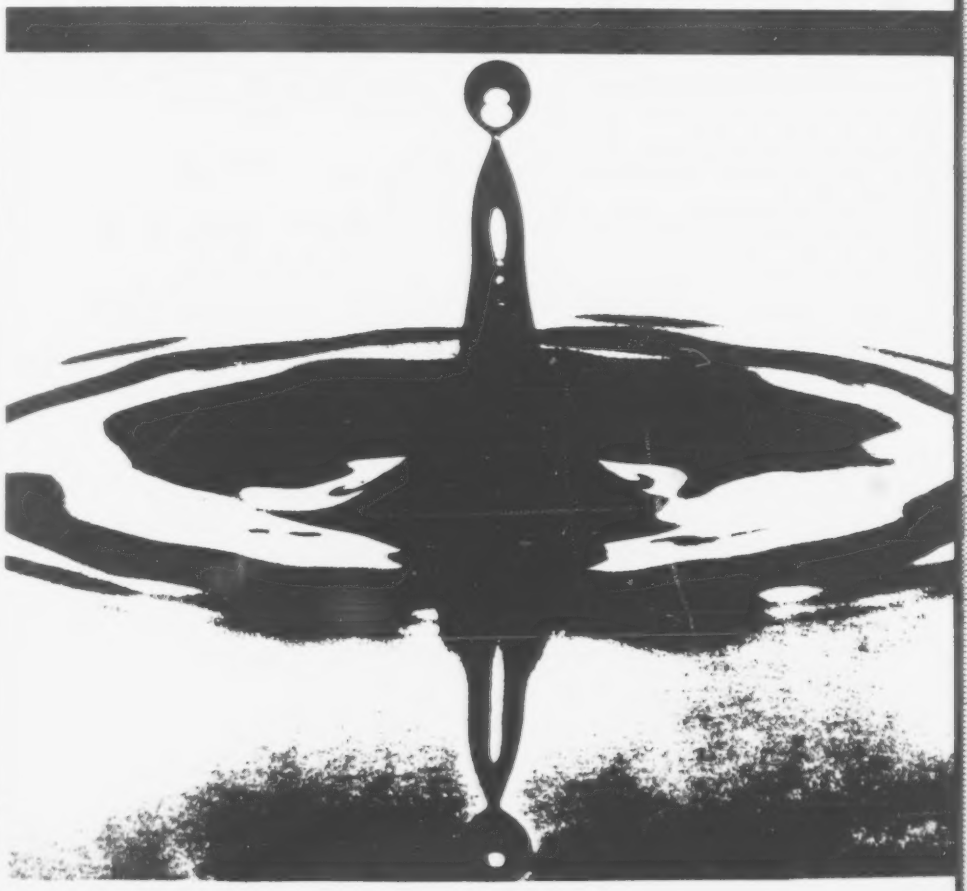


Teacher's Guide

Project Water Science

Prepared by the Water Education Foundation

General Science
High School Level



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Project Water Science

Copyright 1985

Grade level: 9-12

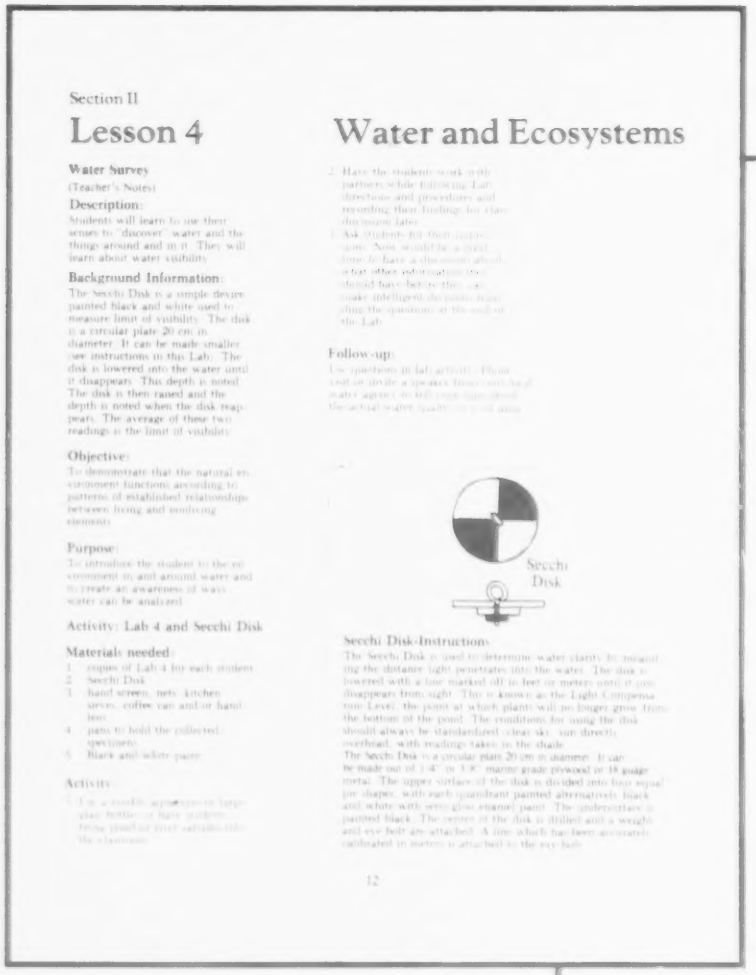
Cost: Complete Set $15.90

Available from:
Water Education Foundation
(formerly Western Water Education Foundation)
717 "K" Street, Suite 517
Sacramento, CA 95814
(916) 444-6240

Description:

Project Water Science is an activity-oriented science program which emphasizes the relationships between water quality, the environment, and people. Designed for use at the high school level, the Project Water Science teaching set includes a teacher and student guide; California Water Resources Development map; Water Trivia quiz; and Layperson's Guide to Water Quality.

This curriculum introduces the water-quality issue, covers elements of the water cycle and California climates, and discusses water ecosystems. Carefully planned lessons provide the teacher with description, objective, purpose, materials, and procedures. Lessons include duplicable student reading exercises and lab instructions, and convey fundamental water concepts and specific water quality testing and purification techniques. In addition, students are asked to evaluate their personal water use habits.


Section II

Lesson 4

Water and Ecosystems

Water Survey

(Teacher's Notes)

Description:

Students will learn to use their senses to "discover" water and the things around and in it. They will learn about water visibility.

Background Information:

The Secchi Disk is a simple device painted black and white used to measure limit of visibility. The disk is a circular plate 20 cm. in diameter. It can be made smaller (see instructions in this Lab). The disk is lowered into the water until it disappears. This depth is noted. The disk is then raised and the depth is noted when the disk reappears. The average of these two readings is the limit of visibility.

Objective:

To demonstrate that the natural environment functions according to patterns of established relationships between living and nonliving elements.

Purpose:

To introduce the student to the environment in and around water and to create an awareness of ways water can be analyzed.

Activity: Lab 4 and Secchi Disk

Materials needed:

1. copies of Lab 4 for each student
2. Secchi Disk
3. hand screen, nets, kitchen sieves, coffee can and/or hand lens
4. pans to hold the collected specimens
5. Black and white paint

Activity:

1. Use a mobile approach to large glass bottles or have students bring small or more sensitive nets to the classroom.

2. Have the students work with partners while following Lab directions and procedures and recording their findings for class discussion later.

3. Ask students for their suggestions. Now would be a good time to have a discussion about what other information the students should have before they can make intelligent decisions regarding the questions at the end of the Lab.

Follow-up:

Use questions in lab activity. Plan visit or invite a speaker from one local water agency to tell your class about the actual water quality in your area.

Secchi Disk

Secchi Disk-Instructions:

The Secchi Disk is used to determine water clarity by measuring the distance light penetrates into the water. The disk is lowered with a line marked off in feet or meters until it disappears from sight. This is known as the Light Compensation Level, the point at which plants will no longer grow, from the bottom of the pond. The conditions for using the disk should always be standardized: clear sky, sun directly overhead, with readings taken in the shade.

The Secchi Disk is a circular plate 20 cm in diameter. It can be made out of 1/4" or 1/8" marine grade plywood or 18 gauge metal. The upper surface of the disk is divided into four equal pie shapes, with each quadrant painted alternatively black and white with semi-gloss enamel paint. The undersurface is painted black. The center of the disk is drilled and a weight and eye-bolt are attached. A line, which has been accurately calibrated in meters is attached to the eye-bolt.

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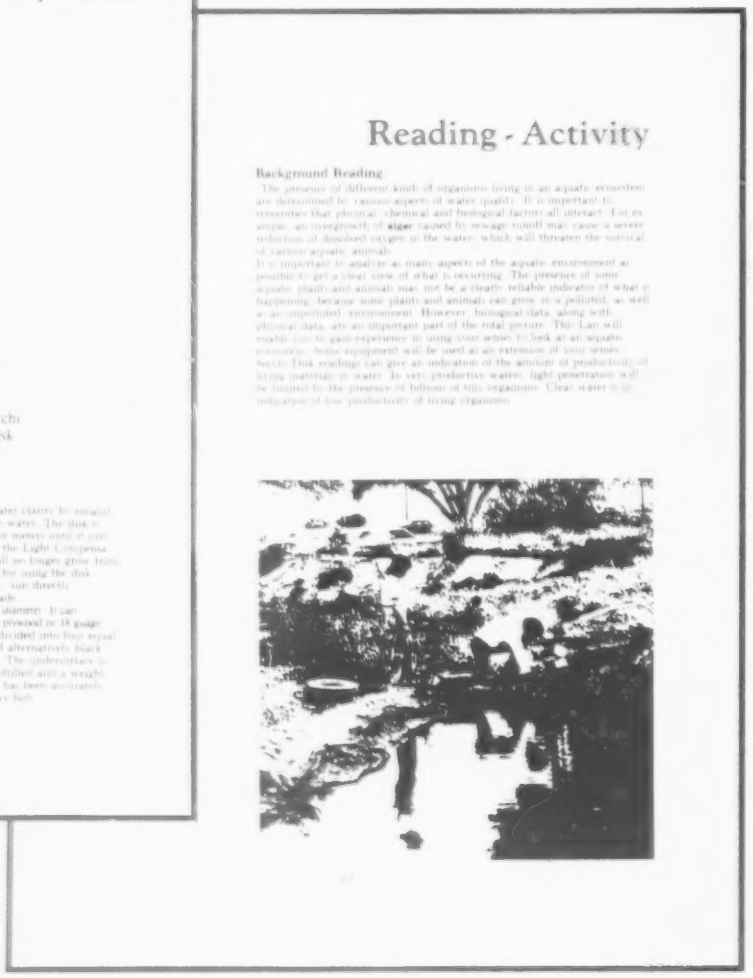
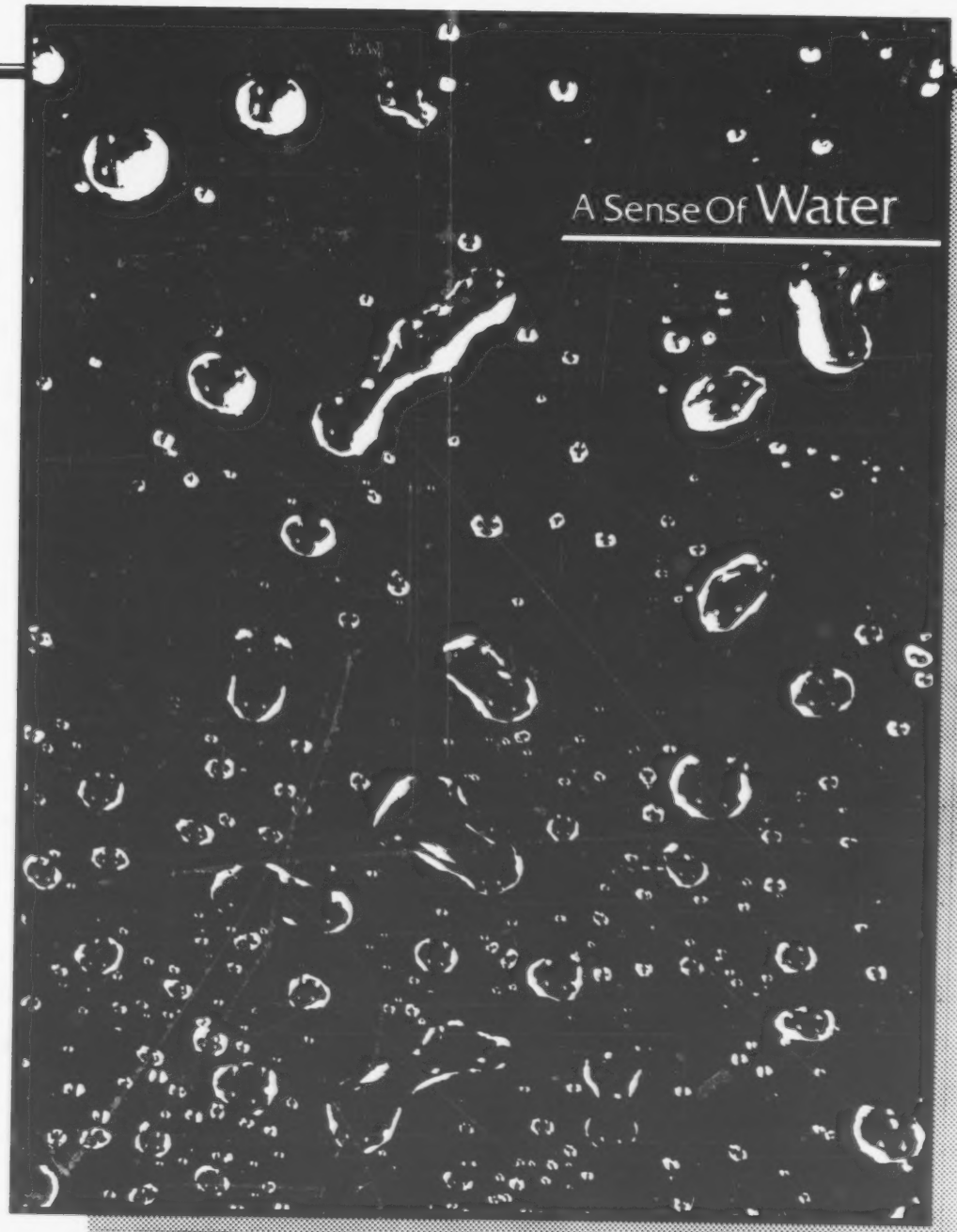
Teacher and Student Guide


Reading - Activity

Background Reading

The presence of different kinds of organisms living in an aquatic ecosystem are determined by various aspects of water quality. It is important to remember that physical, chemical and biological factors all interact. For example, an overgrowth of algae caused by sewage runoff may cause a severe reduction of dissolved oxygen in the water, which will threaten the survival of various aquatic animals.

It is important to analyze as many aspects of the aquatic environment as possible to get a clear view of what is occurring. The presence of some aquatic plants and animals may not be a clearly reliable indicator of what is happening, because some plants and animals can grow in a polluted, as well as an unpolluted, environment. However, biological data, along with physical data, are an important part of the total picture. This Lab will enable you to gain experience in using your senses to look at an aquatic ecosystem. Some equipment will be used as an extension of your senses. Secchi Disk readings can give an indication of the amount of productivity of living material in water. In very productive waters, light penetration will be limited by the presence of billions of tiny organisms. Clear water is an indication of low productivity of living organisms.



Permission to use this material granted by The Southern Arizona Water Resources Association, Inc.

A Sense of Water

Copyright 1984

Grade level: K-12

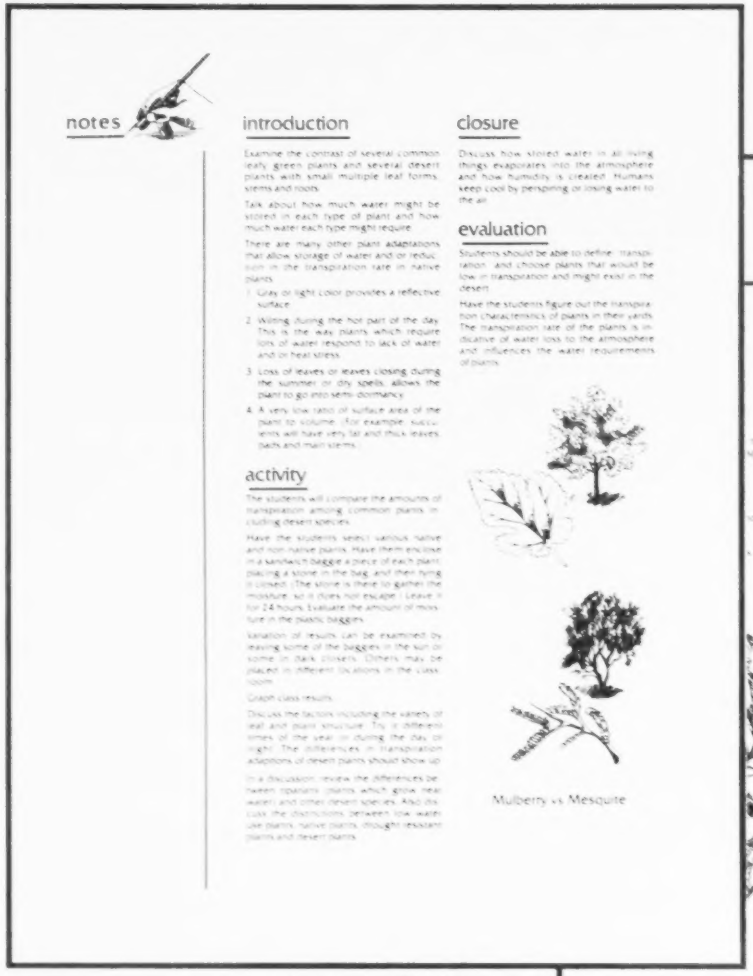
Cost: Teacher's Guide $10.00

Available from:
Southern Arizona Water
Resources Association, Inc.
465 West St. Mary's Road
Tucson, AZ 85705
(602) 624-9000

Description:

A Sense of Water is a comprehensive water education project set forth in two teacher's guides - Primary and Secondary. The backbone of the project is a complete conceptual framework. The teacher's guides are broken down into chapters that address water concepts ranging from the unique properties of water to the effect of water on geography and society. A narrative short course based on the framework and an extensive glossary prepare the teacher to effectively teach about water, the water cycle, regional conditions, water uses and issues, and conservation. Each lesson provides objectives, concepts, key vocabulary, materials needed, background information, grade level, subject area reference, and time requirement, as well as instructions for an introduction, activity, closure, and evaluation.

Although several lessons are designed to teach about water in the arid Southwest, there are a wealth of water topics that have universal application.


notes

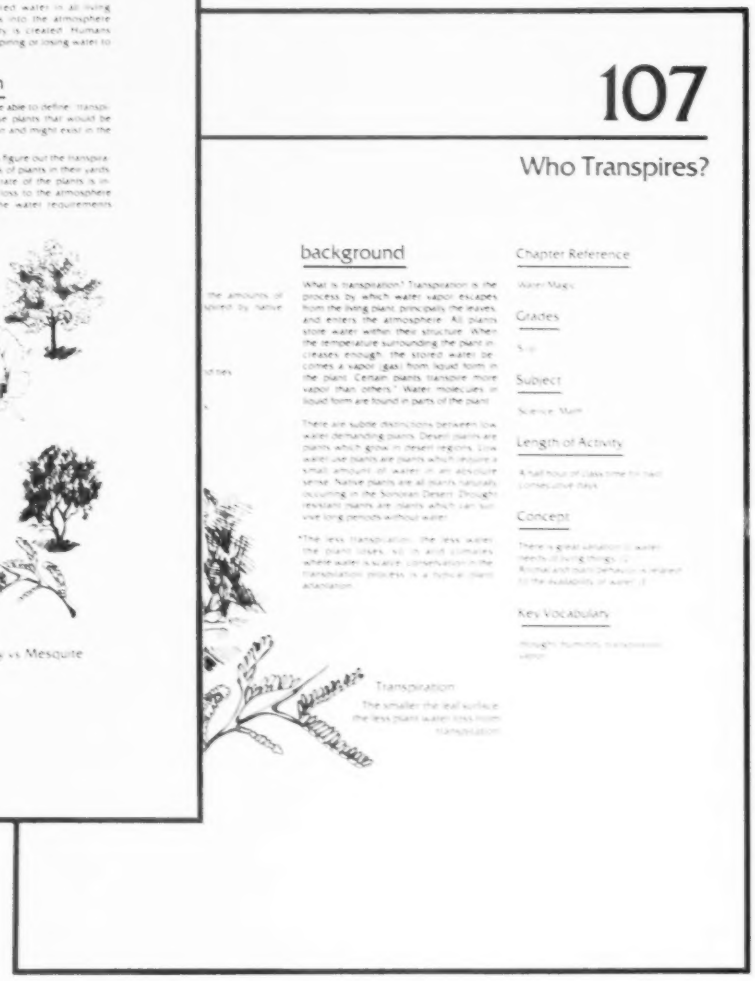
introduction

closure

evaluation

activity

Mulberry vs Mesquite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Who Transpires?

background

Chapter Reference

Grades

Subject

Length of Activity

Concept

Key Vocabulary

Transpiration

Teacher's Guide

TEACHER'S GUIDE SUPPLEMENT

This material developed by the California Department of Water Resources.

Regional Teacher's Guide Supplement

Copyright 1975

Grade level: K-12

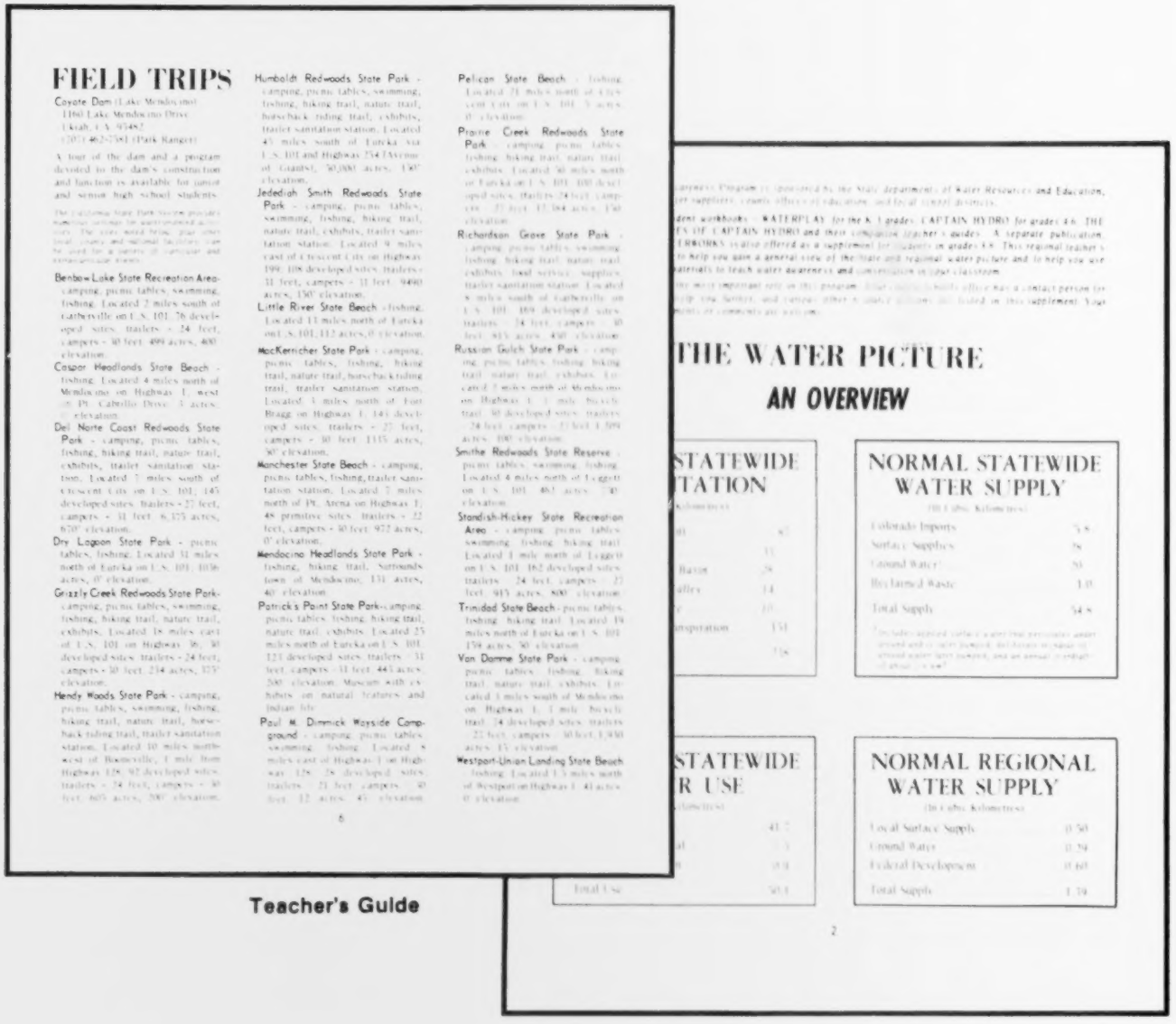
Cost: One copy free.

Available from:
Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236-0001
(916) 322-3070

Description:

The Regional Teacher's Guide Supplement provides water information specific to particular regions of California. The 58 counties in California are divided into seven regions. There is a guide for each region. Each of the seven guides lists resources for films and field trips and provides information on the local water picture as well as information on water supply and development in California. Although each guide is designed as a supplement to any water education program, each provides "More Ideas" for use with Water Play, Captain Hydro, The California Water Works, and The Further Adventures of Captain Hydro. Vocabulary lists are included.

These guides are a helpful resource because they give teachers background information and ideas for extending students' experiences in water education



Teacher's Guide

The Story of Drinking Water

Reprinted from The Story of Drinking Water, by permission. Copyright © 1984, The American Water Works Association.

The Story of Drinking Water

Copyright 1984

Grade level: 1-9

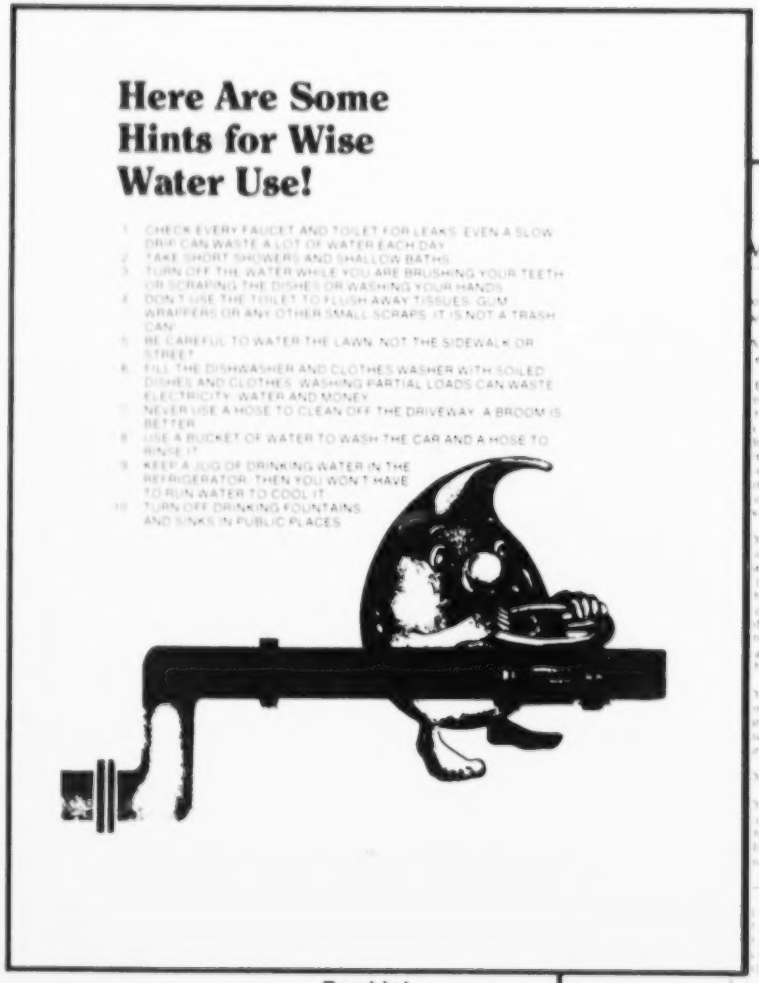
Cost: Approximately $10.00 for one classroom set (discounts for volume).

Available from:
American Water Works Association
School Education Program
6666 West Quincy Avenue
Denver, CO 80235
(303) 794-7711

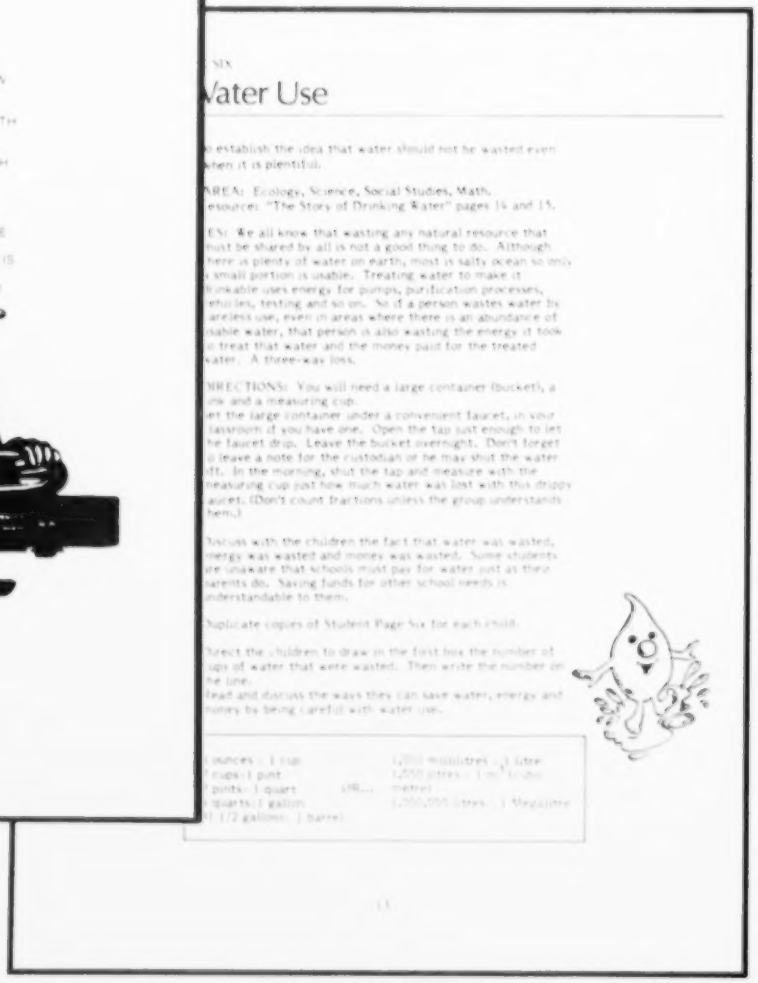
Description:

The Story of Drinking Water is a lively water education program for children from first grade through junior high. The program features The Story of Drinking Water booklet (suitable for all ages) which explains the water cycle, water supply, treatment, distribution, and water uses along with suggestions for wise use. Two sheets are provided for local water data and field trip information to be supplied by the local water utility.

Three teacher's guides are available - one each for Primary (grades 1-3), Intermediate (grades 4-6), and Advanced (Jr. High or gifted elementary) students. Each guide contains sequential lesson plans, reproducible activity pages, a helpful glossary, and additional ideas called "Added Attractions." There are imaginative lessons in science, language arts, social studies, art, and math. Advanced-level lessons provide opportunities for use of higher-order thinking skills.


Here Are Some
Hints for Wise
Water Use!
1. CHECK EVERY FAUCET AND TOILET FOR LEAKS. EVEN A SLOW DRIP CAN WASTE A LOT OF WATER EACH DAY.
2. TAKE SHORT SHOWERS AND SHALLOW BATHS.
3. TURN OFF THE WATER WHILE YOU ARE BRUSHING YOUR TEETH OR SCRAPING THE DISHES OR WASHING YOUR HANDS.
4. DON'T USE THE TOILET TO FLUSH AWAY TISSUES, GUM WRAPPERS OR ANY OTHER SMALL SCRAPS. IT IS NOT A TRASH CAN.
5. BE CAREFUL TO WATER THE LAWN, NOT THE SIDEWALK OR STREET.
6. FILL THE DISHWASHER AND CLOTHES WASHER WITH SOILED DISHES AND CLOTHES. WASHING PARTIAL LOADS CAN WASTE ELECTRICITY, WATER AND MONEY.
7. NEVER USE A HOSE TO CLEAN OFF THE DRIVEWAY. A BROOM IS BETTER.
8. USE A BUCKET OF WATER TO WASH THE CAR AND A HOSE TO RINSE IT.
9. KEEP A JUG OF DRINKING WATER IN THE REFRIGERATOR. THEN YOU WON'T HAVE TO RUN WATER TO COOL IT.
10. TURN OFF DRINKING FOUNTAINS AND SINKS IN PUBLIC PLACES.

Booklet



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APPENDIX A

Science Framework Addendum [1]
Concepts Related to Water Education

Concept Number		Addendum Page
	Biological Science Concepts	
1.	The cytoplasm in all cells consists largely of water and proteins	19
2.	All plants need water	21
3.	Soils provide water and minerals that plants need	22
4.	Plants have adaptations that enable them to obtain and store water	22
5.	Roots absorb water by a process called osmosis	23
6.	Cohesion and adhesion assist the plant in taking water and minerals up into the leaves	23
7.	Water assists chemical reactions in the plant	24
8.	Algae, simple plant-like organisms, live in water	26
9.	Animals live in the oceans and in fresh water	28
10.	All animals need water	28
11.	Animals have adaptions that enable them to obtain and store water	29
12.	Animals give off water	29
13.	A deficiency of water can impair life - growth, activity, and reproduction [2]	30
14.	People need water for good health [2]	32
15.	Population sizes may be limited by water supply [2]	39
16.	An ecosystem consists of a community of living things interacting with each other	39
17.	Matter needed to sustain life in an ecosystem is cycled and reused (eg. water cycle)	42
18.	Human populations can pose problems for ecosystems: a) depletion of resources, b) pollution of resources, or c) technologies altering the environment	42
	Earth Science Concepts	
19.	Soils provide water and nutrients to plants	47
20.	Earth's surface features include rivers, lakes, oceans, and ice caps	47
21.	Humans depend on natural resources for the necessities of life	47
22.	Water is a major agent of erosion	48
23.	Water is a major natural resource needed by humans	49
24.	Water is in limited supply	49
25.	Conservation of resources is an ethical concern	49

26. Energy is required to convert matter from a less useful to a more useful form for people . 50
27. Renewable resources naturally convert to a more useful form (eg. water cycle) 50
28. Decisions involving use of natural resources have an ethical dimension for society 52
29. Water evaporates and condenses, freezes and melts 53
30. Rain and snow come from some kinds of clouds 53
31. Heat from the sun changes water from solid into liquid and liquid into gas 54
32. Clouds and fog form when moist air is chilled and water vapor condenses 55
33. When enough water accumulates in clouds, rain or snow falls 55
34. Water is essential to all forms of life 57
35. Nearly three-fourths of the earth's surface is covered with water 57
36. Over nine-tenths of the earth's water is salty 57
37. The earth's water moves constantly through the water cycle 57
38. The earth's temperature range allows water to exist as a solid, liquid, and gas 58
39. Energy from the sun drives the water cycle 58
40. Distillation is one way to produce fresh water from salt water 58
41. Water has some unusual properties (eg. solid form less dense than liquid) 59

Physical Science Concepts

42. Heating causes solids to melt and liquids to evaporate. Removing heat causes condensation and freezing 61
43. One source of energy is flowing water 72
44. Sunlight gives rise to a renewable resource - falling water 72
45. Potential energy is stored and can be released to do work (eg. hydroelectrical power) . . . 73
46. Hydro power generation involves a conversion from potential to kinetic energy 73
47. Environmental effects of energy conversions are an ethical concern 73

Science, Technology, Individuals, and Society

48. The nature of our society is strongly influenced by science and technology 9
49. Science and technology have been applied to solve human problems and enhance human creativity (eg. weather forecasting) 10

1/ California State Department of Education, Science Framework Addendum for California Public Schools, 1984.

2/ The Addendum refers to dietary needs, which include water.